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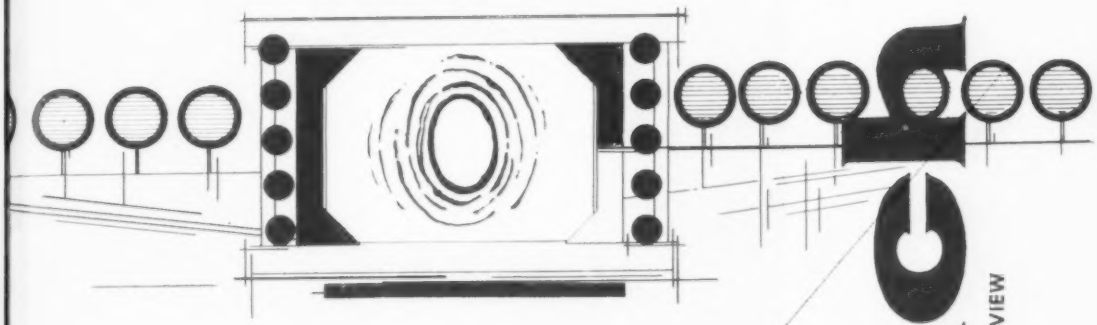

approach

THE NAVAL AVIATION SAFETY REVIEW

NAVAER 00-75-510

Special.....
IN THIS ISSUE
Mirror Report

Vol. 2
No. 10

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This periodical contains the most accurate information currently available on the subject of aviation accident prevention. Contents should not be construed as regulations, orders or directives unless so stated. Material extracted from Aircraft Accident Reports, OpNav Form 3750-1 and Anymouse (anonymous) Reports may not be construed as incriminating under Art. 31, UCMJ. Names used in accident stories are fictitious unless stated otherwise. Photo Credit: Official Navy or as credited. Original articles may be reprinted with permission. Contributions are welcome as are comments and criticisms. Address correspondence to Director, U. S. Naval Aviation Safety Center, NAS Norfolk 11, Va.

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Illustration page 9: Courtesy of North American Aviation, Inc.

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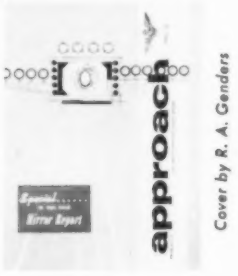

Cover by R. A. Genders

In this issue, *Approach* departs from its usual format to present a special report on a subject of particular significance — the mirror landing system. A major portion of the magazine has been allotted to a series of related articles intended to wrap up the general mirror picture in a single package of known information.

The remarkably short period of time required to adapt, develop and integrate the Optical Landing System into standard carrier operations has caused the "mirror" to become a deceptively familiar addition to aviation terminology. However, aside from the relatively limited number of aviation personnel who have actually operated with the mirror, it is reasonable to assume that a considerable amount of unfamiliarity with specific principles and techniques still exists among naval aviators in general.

For that reason, and because the mirror landing approach promises to become increasingly evident in both carrier *and* shore-based flight operations, this comprehensive survey should provide an interesting, informative addition to the pilot's general store of knowledge. The report is not intended to conflict with official policy or current directives as they become available.

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Letters may be forwarded either via official channels or direct on Anymouse forms. All letters should be signed, names are withheld on request. Address Approach Editor, U. S. Naval Aviation Safety Center, NAS Norfolk 11, Virginia.

Sir:

In relation to current "Crash Rescue Information," I would appreciate any information you might give me on where I can obtain copies for our local helicopter crash rescue file. With moderate to heavy stopovers of naval transient aircraft at our station, it would be in the best interest of flying safety to incorporate these in our crash rescue files.

We're mainly concerned with the following: F7U, F9F, FJ, S2F, F3D and TV.

LT RICHARD J. MAZNIO
OIC Heli. Sec.
Base Operations
Webb AFB, Texas

Thanks for your interest. The posters are in the mail. Navy units requiring such posters should request the poster series NavAer 00-80zz-88 from Aeronautical Publications. These include the above, the TV series, but not the S2F. BuAer advises that a master of Navy crash crew rescue charts is in the mill. In the meantime, many manufacturers representatives have such booklets for their aircraft as well as the appropriate handbooks.—Ed.

Sir:

With regard to our telephone conversation, I am herewith submitting my suggested item for your interest. . . .

. . . I don't pretend to know just how effective the Wheel Watch Program is, but for over a year I have felt that there is room for improvement. This idea may have already been considered, but because it is not in use I can only speculate that it may be new and so I therefore lay the "ball" in your lap.

By way of information I would like to state that I have always been a multi-engine pilot and may not view the wheel watch with the same evaluation as an experienced carrier pilot who has worked constantly with LSO. With these few words of introduction, here are the particulars.

I would recommend that one or the other of these two changes in the large WHEELS sign at the end of each runway. First—install a large flashing light on the board and secondly—revamp the board so that the letters of the word WHEELS are recessed into the sign and then line the recessed letters with some form of flashing lights or neon system. These lights could easily be activated from the control tower.

Briefly I will attempt to list some of the advantages of this improvement, and while I won't be specific, they will also reflect what appear to be some of the shortcomings of the present program:

1. This light system will eliminate the need of manpower at the end of the runway.

2. With these lights elevated to the approach angle it will have much greater djstance of visibility (as compared to a man standing with paddles), and thereby afford the pilot a longer period of time to get his wheels down if not already down.

3. This system would be available and suitable night and day (24-hour operations) as compared to the somewhat limited schedule of the present wheel watch program.

4. This system would be suitable and effective during instrument conditions where, I understand, there is *no* Wheel Watch.

I guess I could dream up several more arguments for discussion . . . but I'm sure you have the idea. Before someone argues against this because of cost of cable, . . . a power supply at the WHEELS sign would serve the purpose for a preliminary evaluation.

GAYLORD E. HILL, LCDR, USNR
Mobile Intelligence Production Unit (Atlantic) Naval Base, Norfolk, Va.

Any comments on this interesting proposal?—Ed.

Sir:

The present method of ditching a helicopter has become quite a thing of controversy.

As a delegation of one I will attempt to lay down some facts against the present procedures and present some facts and statistics for a possible change in ditching procedures for HSS-1/HUS helicopters.

The present method is to make a normal auto-rotation to the water, if time and altitude permit, and upon decreasing ground speed to a minimum, flip the rascal over on its side and down collective just as you enter the water.

The reasoning behind this was good at the time, but times have changed. The collective was used to come to a hover just above the water; then, as the wheels entered the water, an attempt to stop the rotors immediately was made by rolling sharply to the left, and their

Letters to the Editor continued

collective pitch on the blades decreased allowing them to bite deeply into the brimy.

The older rotor systems were light and would stop abruptly or separate themselves from the machine allowing the pilots and crewmen to enter the water and not be clobbered by a stray rotating rotor blade. This was the primary reason for this procedure.

Recently, HS-5 ditched an HSS-1 and the prescribed method was used, and from personally talking to all hands aboard, it wasn't pleasant. Everything went well until the attempt to stop the rotor was made by rolling the aircraft to the left upon entering the water; then all hell broke loose and fuselage walked up on its nose and bashed in on its right side, then over on its back and sank immediately, nose down. All hands submerged and

came up later. The rotors did not come off and when they stopped so abruptly something had to go.

I am of the opinion that the main rotor blades will not come off or shatter when ditching under controlled autorotation conditions. References HS-1 AAR 1-56 and HS-5 AAR 2-56 also HS-3 AAR 4-56 indicates that the main rotor blades struck the flight deck with a great force without the blades coming off or shattering.

About the same time HS-5 had their little bout, I ditched an HSS-1 with full load from about 300 feet at 60 knots without a tail rotor. Although directional control could not be maintained even in a full autorotation, it was elected to maintain attitude no matter which end was going first. I approached the water at about 40 knots, heading 90 degrees from the direction I was going and made a gentle side flare to kill my ground speed.

As the water came up I applied full collective holding the fuselage on the surface of the water using all the energy possible in the rotor to remain afloat. The plane rocked slightly and the blades popped the water several times bringing the craft upright again. At this time the rotor RPM was down to about 150 on the rotor brake was applied. The rotor stopped just in a few turns and we were floating high and dry with only a few inches of water over the cabin floor.

There was never any impact yawing or unusual attitude and the plane drifted about 50 feet before settling to the bottom in about 8 feet of water. This procedure may not work as smoothly in a rough sea, but I do think it's worth looking into.

LT D. C. FRIDLEY, USN
Survival and Ass't Safety Officer, HS-1

Several other individuals from two different units have expressed the same concern for the HSS ditching technique. All have expressed the same concern and proposed the same solution—"Let the helicopter settle straight down while applying rotor brake."

This technique appears to have merit and would eliminate that initial and violent passenger disorientation associated with the ditchings recorded in this and other model helicopters.—Ed.

Sir:

I found your article "Why Log Engine Over-Temps?" in the February issue of *Approach* interesting and informative.

We would greatly appreciate permission to reprint this article . . . this material could be especially useful to our field personnel as well as to personnel of aircraft companies . . .

The need for complete and accurate logging of engine over-temperatures has been recognized also by the Air Force. In fact, the recording of such over-temperatures are considered of such importance that the Air Defense Command has taken steps to eliminate the human element in this—to have the logging done automatically by instruments. The Time-Temperature Recorder, which our company is manufacturing for this purpose for ADC, will soon be installed in operational F86Ds.

Our engineering people are now working on additional designs that will make this instrument system readily applicable to any jet engine, for any type of aircraft. It occurred to me in reading your article that many of your readers might have information regarding over-temperatures and their effects on engine performance which might be helpful in making this equipment of greatest value to the services.

J. T. MINAROVICH
Chief Service Engineer
AVIEN, INCORPORATED

Permission granted.—Ed.

Sir:

Thought you'd be interested in the following note sent to our jet jockeys:

At the risk of incurring the undying wrath of the Metrodential Life Insurance Company, we're going to tip you off to some insurance that won't cost you a dime. Now this insurance we're speaking of isn't the kind that pays your beneficiary a few bucks after you've passed beyond this vale of tears. This insurance does just what the word says—it helps you stay around long enough to trip over your long, gray beard and bust your own empennage.

A couple of weeks ago, one of the boys from JTTU ejected right after takeoff at about 2000 feet. As it happened, he was on fire and didn't have a lot of time in which to decide what to do. As a matter of fact, before he could say "Pre-pos-ox-pull," our lad was floating gently to earth under a nice white umbrella.

We talked to this wise gent and found that he had long been a holder of one of these insurance

policies. It had never cost him anything except a little time which would have been wasted anyway. Here's how he kept it in force. Two, or three, or four times a week at some odd moment during the day or night, he reviewed in his mind one of the several emergency procedures that all F9F pilots should know.

For a very small amount of effort you can keep yourself sharp in your emergency procedures even though you only get to fly the blow-pipes once a month, . . . yes, just take 2 or 3 minutes during the course of the day and go over these emergency procedures in your mind. You'll find that when you next fly the jets you'll feel SHARP and be SHARP. However, unlike the razor blade, that sharpness will get you OUT of a close shave one of these days. Try it, huh? For the first time in history, here is an insurance policy which you'll live to collect the face value of.

P. P. BERMAN
A.S.O. NAS Olathe

Sir:

Your "Rime of the Ancient Mariner" [November] certainly hit the hole in Naval aviation safety—too many commanders going to too many meetings to talk too much and do too little about safety. Safety is something everybody talks about and advises more of but does nothing more for it.

Does the Navy really have an effective safety program? Oh, I know the Navy publishes many safety bulletins which pilots get free but the Gideons put out many Bibles and how many are read? Pilots aren't against learning but they are quite lazy and have to have it sort of stuffed down their throat in large quantities in order to make them think about using it.

So let's bring the pilots hot dope on the hoof. Let's take two pilots who fly in a squadron and put them in AirLant or AirPac. Their primary job will be to go from one squadron to another who also fly aircraft of the type they are familiar, giving safety lectures, flying check flights, and observing the general safety practices for each squadron.

Among their arsenal of equipment would be all accident reports in that type aircraft, maintenance bulletins for the aircraft, latest dope on tactics, and a wealth of knowledge of the aircraft.

Their collateral duty would be to assist in investigation of any accident of that type of aircraft.

This way the pilot is getting the hottest dope personally. It is being brought as close to him as possible at little cost to the Navy.

These hot dope Henries must have many assets: They don't care if they step on someone's toes as long as it is in the interest of safety and gets the job done. (I'll be the first to volunteer). They don't mind traveling. They like to teach. They like safety and have a good knowledge of the aircraft.

If such a program should fail by mismanagement, I disclaim any responsibility for it.

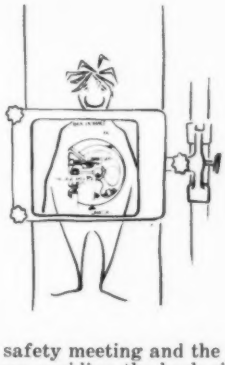
NAME WITHHELD

Any comments?—Ed.

Sir:

An F3D-2T ran off the end of the runway. The pilot over-rotated the nose on takeoff because of a vibrating nosewheel. As the result he got on the back side of the drag curve and couldn't get airborne.

It is interesting, but discouraging, to note that the day before this incident occurred we had an all-



pilot's safety meeting and the main topic was avoiding the back side of the curve on take off. Perhaps if I had used a rubber-headed hammer . . .

FSO
(Frustrated Safety Officer)

Our sympathy on your frustration. . . . Keep trying no matter what. Incidentally, have the new pilots seen article on page 40, February 1956 Approach?*—Ed.*

Sir:

Re the flashlight described by Lt. Trzcinski, Safety Officer for VF11 [Nov. *Approach*], with its 90-degree beam deflection (made suitably flashproof) plus a clip on one side, would be much more convenient and handy for use by maintenance crews working on and performing routine checks on aircraft.

This light can be pushed into a tight space for a look-see, while the conventional type cannot. Of course, there is the antenna type inspection light. This is not, however, furnished in sufficient quantities so as to issue one to all hands. A 90-degree type is also easier to place into position, so the beam will shine where the man is working. For instance, if he is doing something that requires the use of both hands the light could be clipped to something adjacent or can be stood on end or laid down with the beam directed on his work.

Several years ago this type of light was issued to aircraft maintenance units for their use. I feel they are handier and make inspection work easier. This opinion is shared by other (at least some) maintenance personnel.

L. E. CARMAN, ADC
NAS Lincoln

After an informal poll of mechs at one of our larger air bases the conclusions are: 1. advantages of straight beam or 90-degree deflected beam flashlights can be argued 50-50 for each. 2. The straight beam was preferred for all-around work.

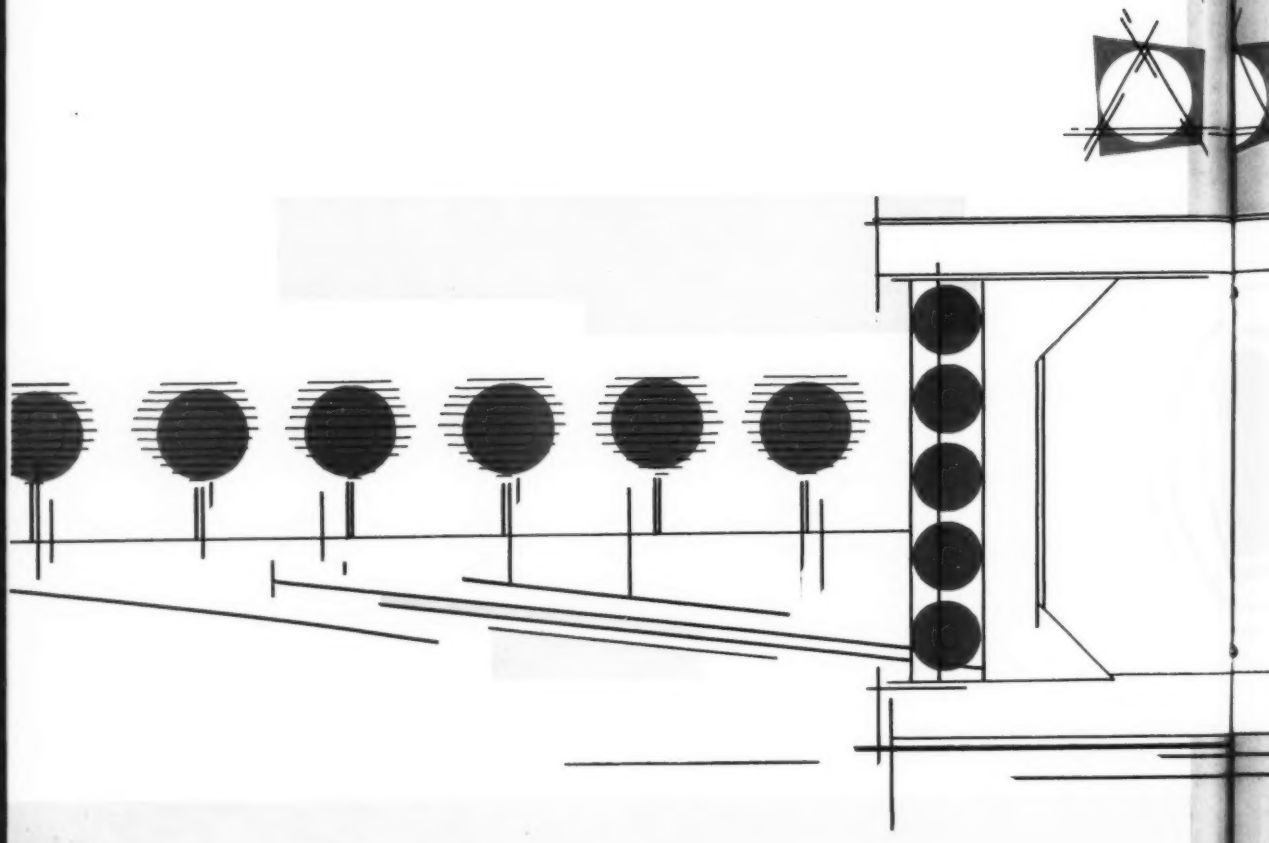
Any other comments on this subject?—Ed.

Sir:

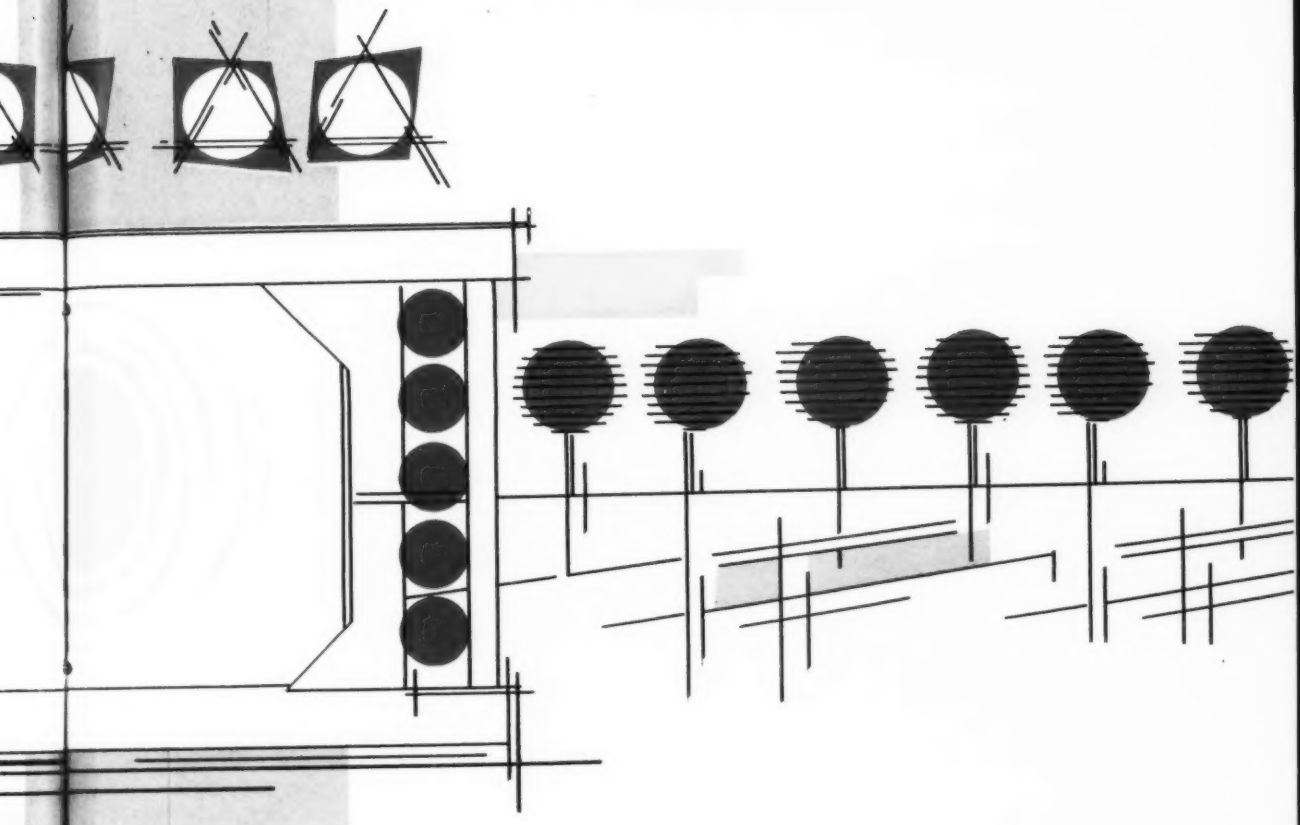
We wish to secure permission to reprint in our monthly magazine, the "Experimenter" the article "Assume the Angle," of August issue of *Approach*. While not directly applicable to the type of aircraft with which we are concerned, still we feel that the article will be of especial interest to our pilot members who ordinarily do not have the opportunity to read such material.

GEORGE HARDIE, JR.
Associate Editor

Glad to have your reprint "Assume the Angle."—Ed.



During the various phases of its development, the "mirror" has occasionally been altered in its construction and appearance, but in any mirror installation, certain basic principles of visual design remain unchanged. On this page Art Director Dick Genders has employed an abstract illustration of a typical mirror to emphasize this relationship of colored lights in the mirror approach system. The vertical movement of the bright amber meatball provides the necessary contrast with the horizontal green datum lights to obtain optimum vertical alignment. The top green lights are prop "cut" signals and the red lights flash on and off for waveoffs. So, the total color pattern thus permits little chance for misinterpretation.



Mirror Report

MIRROR LANDING SYSTEM

Introduction

THE introduction, in 1955, of the Optical Landing System, or "mirror," to U. S. carrier aviation was promptly and enthusiastically hailed as a device of near-revolutionary impact upon the carrier landing accident rate.

Coupled with its alter-ego, the angled deck carrier modification, the mirror offered the most radical change in ship-based flight operations in decades.

Quite obviously, the initial success of mirror experiments offered a tempting opportunity to report the device as the long desired answer to the need for consistent, standardized, optimum carrier approaches. This capability, in turn, would lend itself ideally to the increasing demands of new, high performance aircraft just around the hangar.

Now, after a more deliberate appraisal of some 16 months of actual operation experience with the mirror, and with some 15 angled deck carriers currently employing the mirror in a routine manner, adequate statistics are available for several conclusions.

The "mirror reflection" of the situation is perhaps even more impressive when it is noted that, historically,

Coming aboard neatly "on the rails" is this pilot's view of a mirror approach to the USS *Randolph*.

the first mirror (the original British product) was installed on the USS BENNINGTON in August 1955 for evaluation. In the relatively few months since then, the mirror *and* the mirror glide path approach have been incorporated on 14 angled deck ships, and about 20 mobile versions are slated for shore-based use.

Understandably, many of these installations are relatively new, and the early data recorded is somewhat lacking in depth when compared to conventional carrier landing history, but the *immediate effect of the mirror on carrier landing accidents is undeniable.*

For example, in the years immediately prior to calendar 1956 and the general employment of the angled deck plus mirror, the all-Navy major carrier landing accident rate had been about 3.0 per 1000 arrested landings.

Since the appearance of the mirror in substantial numbers, that rate has been reduced to below 2.0 accidents per 1000 landings.

This mirror influence has been cumulative in that, only by the first quarter, fiscal 1957, did the number of arrested *angled* deck carrier landings overtake the number of *axial* deck landings. Similarly, at that time the number of mirror landings had increased to represent more than one-third of all the carrier landings.

To the natural question of "Just how good is the mirror?" the following summary is made:

From July 1955, the quarter in which the operational evaluation and use of the mirror system was begun, through September 1956, the angled deck *plus* mirror logged 19,202 landings, experienced 9 major accidents for a carrier landing accident rate of 0.47 per 1000 arrested landings.

The angled deck *less* mirror reported 39,230 landings and 53 accidents for a rate of 1.35.

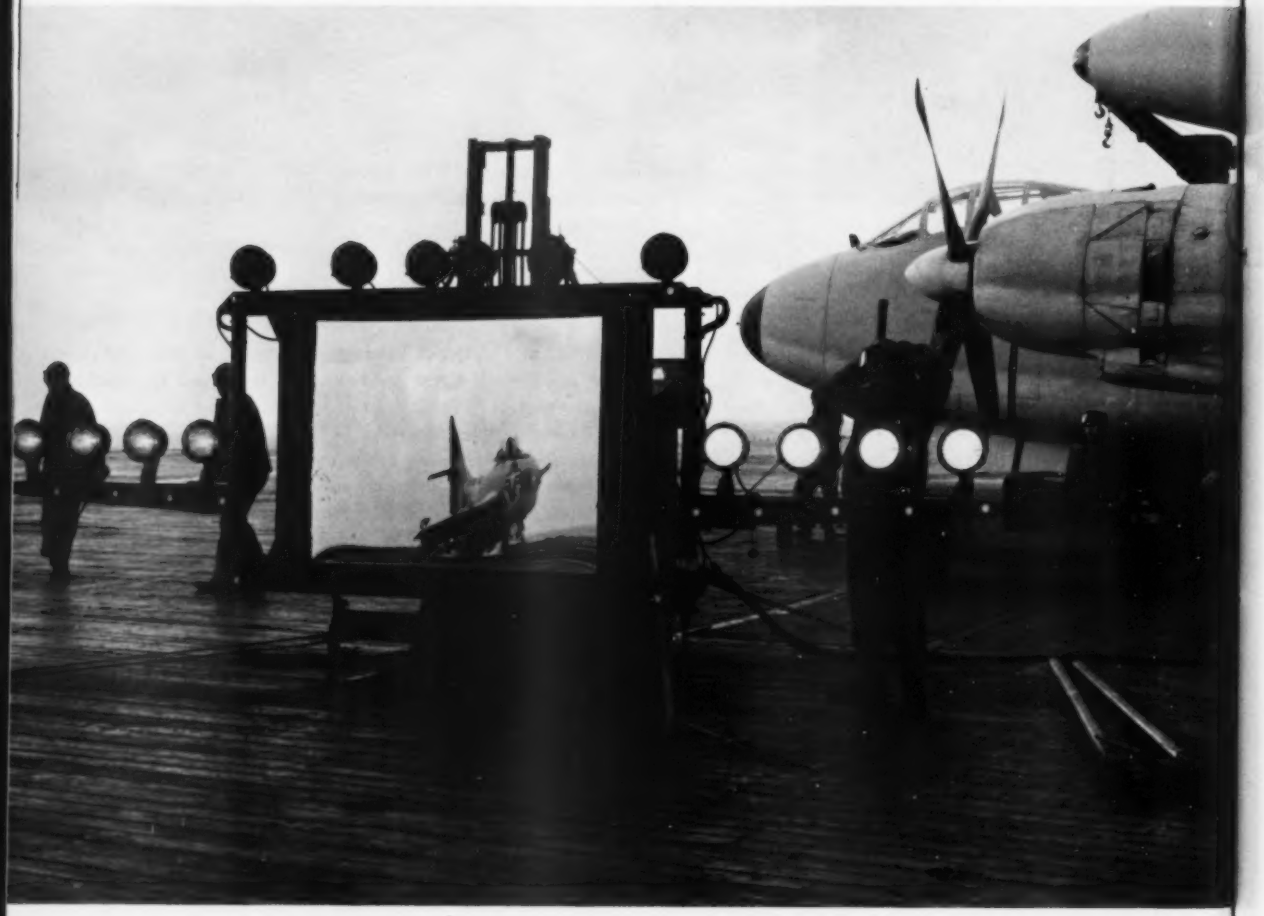
The axial deck carriers reported 98,591 landings and 207 landing accidents for a rate of 2.10.

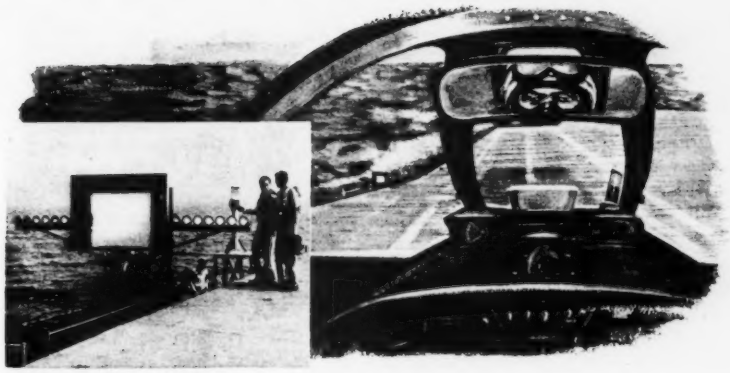
It is realistically expected that this picture will change somewhat from quarter to quarter, with the mirror's initial degree of superiority being reduced as various secondary effects, to be discussed later, become apparent.

For now, the image seen in the mirror is bright, clear and rosily tinted with promise for the future.

HOW WOULD YOU LOOK IN THE MIRROR? NOT BAD AT ALL EVEN IF, LIKE OUR LT. MOE CLAGHORN, YOU CAME BACK AFTER A FIVE-YEAR LAYOFF TO FIND YOURSELF MAKING A CARRIER LANDING . . .

Carrier pilots have entered a safer era with the adoption of a new approach/landing system





THROUGH THE LOOKING GLASS

By
Lt. James Lyons
Senior LSO, ATG-202

THERE'S no business like show business—or the carrier approach business either.

Though the outward aspects are often the same, who would ever think that lights and a mirror for each performer would be two such good insurance items.

There've doubtless been many varied tales told around a congenial bar stool about this new combo with verdicts ranging from "sat" to "unsat."

Let's add to your collections and move in on what are very likely the thoughts and actions of an older (distinguished-looking) and not-so-bold pilot making his first try at it.

We'll pick up the story of Lt. M. (Moe) Claghorn shortly after his takeoff and joinup over NAS Oceanside.

It'd been five years since he'd done any CV flying. He'd just completed a tour as ship's company on a carrier—watching everyone else have their fun from the other end.

Now that his long sought dream of getting back into a squadron has come true, he finds to his dismay that there've been one or two major changes from the old days. An angled deck with nothing to run into on the far end was fine and dandy—but this mirror gimmick raised a definite question mark.

Gone were the days of old Dog Finkle standing out there in his Mickey Mouse suit—all arms and paddles and many hard words.

Now, instead of a duet of the pilot and LSO singing at each other, here was a new act consisting of a trio with this new member "up in front" with the pilot. It took a lot of selling before Moe finally bought the idea and even now he wasn't too sure he wanted to pick up the merchandise. Continued next page

But, there he was, tacked onto a qual hop and trying to remember the briefings they'd thrown at him.

The flight was led by the Skipper with Moe and two brand new ensigns in tow. The quartet completed a routine joinup and pointed their way out on their latest vector.

As the flight settled down on its heading and the fledglings with their feverish formation positions were pushed out to a safe distance, Moe anxiously tried to recall some of the sage words of the Staff LSO on this new "invention."

Both the LSO and the Skipper had done nearly everything but fly it for him, but the fact that there was no field mirror available for tryouts did little to soothe Moe's worn peptic. It was encouraging, however, to recall some of the old boys recommending the mirror as the best thing out since the wheel.

Parts of the nearly forgotten spiel flashed back through his mind.

". . . Now there's nothing complicated about this contraption. In fact, one of its main advantages is its simplicity.

"The real purpose behind it is to bring you in on a modified GCA approach path using this mirror reflector as your final visual controller. Except under abnormal conditions, this lighted glide path, or meatball, never varies because you've got a lipbanger, called a 'stabilizing element in pitch' to keep it at a constant angle. In other words, it's up to *you*—really the only human element in this process—to fly the proper approach. . . ."

So they're leaving it up to the pilot nowadays, thought Moe. That'd been a big bone of contention with the LSO's back then—just who was flying who?

If it lights the way for you, I'll bet that meatball would be a welcome sight when it comes to night flying (perish even the thought).

". . . To put it tritely—'in many cases and barring future changes,' this mirror will be located on the port side.

". . . The source lights for your meatball are located aft on the same side and are focused into a single spot in this concave mirror. The reflection bounces off forming an optical glide path for you to follow on down. It amounts to a quick and accurate altitude signal transmitted with the speed of light. . . ."

Fancy words, but it sounded simple enough.

It even brought old "Granny" Potts in on a right-hand approach last week when he had an emergency.

Then came the jolt back to the present as the Skipper came up with a change to the carrier land/launch frequency. Sure enough, there she blew—dead ahead and 20,000 feet down, angled deck and all.

In rapid succession came the check-in followed by a Charlie 7 from Pri-Fly. The hooks came down, speedbrakes out and over they went.

". . . What you'll see down there is a large rectangular mirror with a horizontal bank of green datum lights midway up on either side.

"Line the meatball up with these in your approach but watch those red lights flash on and off for waveoffs. The green ones on top are cut lights for the props.

"Both are operated by the LSO from his old platform domain. Everything through the break is the same as ever. . . ."

With the ship still hunting for the wind too, I suppose, Moe frets, as they begin their standard breakup upwind. No need to worry about that today though—it's howlin' up a storm down there.

". . . Keep that altitude between 350 and 400 feet—or

Continued

THROUGH THE LOOKING GLASS

Author Jim Lyons, senior LSO for ATG 202 aboard the USS *RANDOLPH*, laid down his paddles long enough to team with Ens. Chuck Magee of the same Task Group to provide us with this excellent mirror article. Jim has been "waving" all types and sizes for the past six years. He is a USC Safety School graduate.

maybe even 450 feet—on your downwind leg. Other than that, the approach is about the same until the time you pick up the meatball and start your descent. . . ."

Comes my checkoff-list by the 180—no change there for sure. Seems to me I'm awfully high, but the man said 400 feet all the way around through the 45.

". . . You should see the meatball shortly after the 45-degree position. If you don't, keep lookin'—but keep in mind you've other things to do.

"You've got *three* items for your divided attention: (1) *airspeed*—get it where you want it and trim for it early. (2) *lineup;* take care of this early too and hold it, but note—the mirror is useless as far as lineup goes. Use the markings on the Flight Deck.

Number (3), and by no means least, is the *meatball.* . . ."

There it was for Moe—a big yellow orange blob right smack in the middle. Now to point this thing along that slanted deck and start her down easy-like!

". . . Keep that meatball in the *horizontal* center—it's easy to do while you're still out a ways. Keep in mind your low freq radio beam—it's the same thing.

"You've got lots of latitude as long as you keep your distance—when you get in close, use care, brother.

"The nearer you are to a touchdown, any changes you make with that nose—especially if you're not on the money in your airspeed control—will compound themselves faster than the old lady's charge account on pay day. . . ."

So if she goes high, I'm high, worries Moe in his descent with ever-increasing hope that it would be love at first sight for hook and wire.

". . . If the meatball starts to drift a little high or low, take it easy and gentle—don't horse that stick. Leave the throttle alone.

"Above all, *don't stare* at any one of those three concerns mentioned. Keep that scan going all the way—airspeed, lineup and the meatball. . . ."

Now that you've got it in the bag, don't get restless, Moe boy. Sit back and enjoy your prosperity, keeping an eye on those three stocks and bonds. No frantic speculation at this stage of the game just keep that stick and throttle where it is, all the way to touchdown. So far, so good. That hook will make it over the spud roof with room to spare if I do as Mamma taught me.

". . . Remember—if you're lined up, on the glide path (or near enough to it and holding) and in the proper attitude (or speed), Mister, you've done all you can. Now let that interest from your prior investment do the rest. The prop pilots still have the cut to take and the same transition to a landing."

Fly her right on down as is, Moe continues. Got to have that power ready to pour the coal on if my clutcher misses.

". . . You don't flare or dive for the deck—though the average catch is number 3, be happy with 4 or 5. They're as good as 1 or 2 and sometimes better, in spite of what the island roosters may say. . . ."

And if I flare I'll miss them all. Lord-a-mercy, I'm going right through to the hangar deck, moans Moe as the flight deck loomed up with the speed of the morning express.

We'll supply a happy ending here by saying that Moe's dire prediction of a controlled crash through to the underground parking area did not come true.

It's agreed, however, that your first few landings may seem like such.

You *are* coming down that deck a little faster—but not

Continued next page

To look sharp—
and to be sharp—
use the mirror
but watch for the lineup too . . .

Big ones or little ones, smooth landing of an AJ proves it's all the same to the mirror

Continued

THROUGH THE LOOKING GLASS

much steeper in spite of what it looks like.

The missed engagement or bolter (touch-and-go for CAGs) is the least of your worries, provided you haven't cheated in your power control on the way down—as well as having such other "minor items" as enough fuel for another pass. . . . Let's face it though, bolters are as inevitable as potatoes and sour milk in the wardroom mess. Mirror or no—you're bound to get them sooner or later.

Now our hero has landed safely a few more times and given himself a mental "not me" on bolters. So we'll leave him to congratulate himself on his superb performances (before he gets to the readyroom)—back again among the up-to-date carrier veterans.

A few more hints sufficient to the wise: Mirror approaches take getting used to. Some buy it right off like Moe; others fall slowly.

Don't undervalue the LSO's job. He may not seem as busy out there nowadays, but he can still keep you out of trouble by use of the radio (when it works) and those waveoff lights we mentioned.

Speaking of waveoff lights, many of the new boys breaking in on the mirror fail to see these when they're used—possibly because they're staring at the meatball or just too busy with "other" things. *You can't stay alive with pinpoint vision in* any *walk of life.*

The mirror does *not* solve all the problems in a carrier approach. Though it's a vast improvement safetywise and somewhat easier for the pilot, don't fool yourself by overrating it.

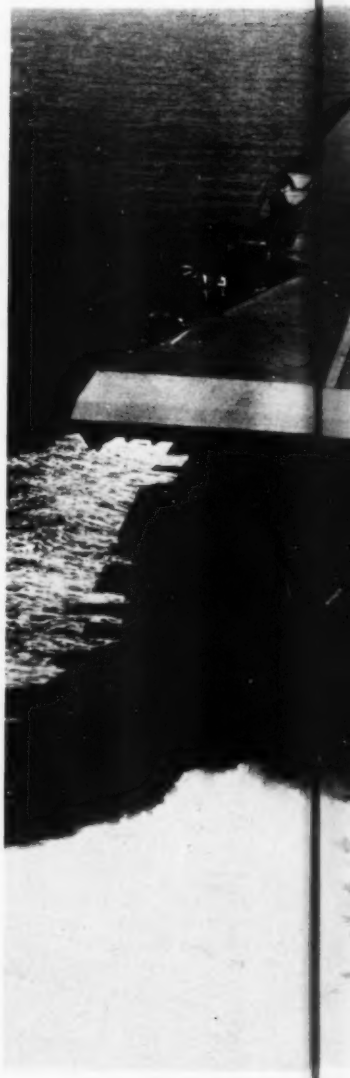
Those who've had basic difficulties on the paddles often experience them on the mirror to a greater or lesser extent.

Speed control is up to you—watch it. The LSO cannot be as sure of it in that descending approach you're making unless he has a SPN-12 that's right on.

The old rule of "take it around" still goes if—(1) one of your five senses is hinting something's not quite right; (2) you lose the meatball. Don't chase it or hunt all over for it in the approach; (3) you're in doubt about the image. You might be seeing a reflection of the sun if it's within 20 degrees or so of the glide path.

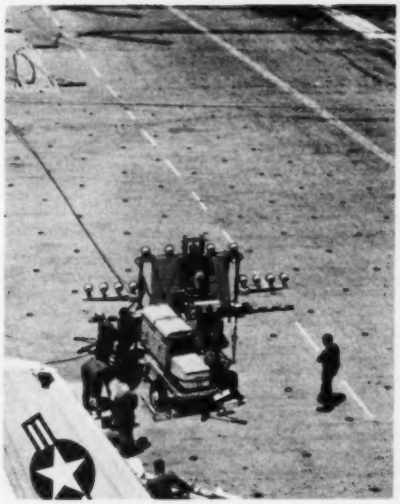
In conclusion, gentlemen—out of that new type of looking glass, better and safer carrier approaches can be made.

It's up to you, the pilot, to stay behind the meatball and not end up behind the 8-ball.



Meatball centered, hold what you've got, and you've got it locked . . . and could be those folded arms of the LSO means a Roger pass, hmmm?

"Just what can it do for me?" is a natural reaction of many naval aviators in their candid appraisal of the mirror.



"Vulture's row" view of forklift mirror shows starboard side installation.

THE MIRROR AND YOU

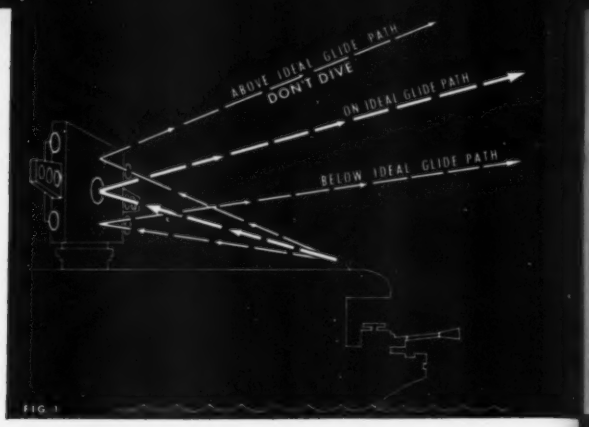
Material for this discussion was obtained from two pamphlets of the same title written by Comdr J. T. Shepherd of the Carrier Suitability Branch of Flight Test Division at the Patuxent Test Center. A limited number of "The Mirror and You," Vols. I and II, are available on request from Comdr Shepherd, who offers the information not as an official publication but to "merely include some of the pointers I have picked up in my travels during the last year or so."

A TYPICAL mirror installation, such as is found on the USS BON HOMME RICHARD, is made from a curved sheet of aluminum 5 feet wide and 4 feet high. (*Current standard mirrors are 4' x 4', of plastic construction—Ed.*)

The mirror is curved and could be imagined to have been cut out of a cylinder with a 10-foot radius.

A group of source lights, located 173 feet aft of the mirror (this distance may vary with individual installations) is focused into a single spot on the mirror, forming the "meatball." (Present ship installations include varying combinations of port and starboard locations. Planned policy calls for port installations in all cases.)

The reflection of the source light bounces off the mirror and forms an optical glide path for you to follow down to the deck. The inclination of the glide path



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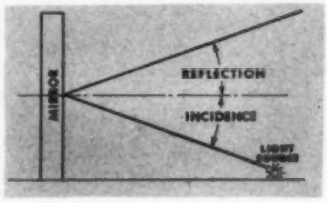
THE MIRROR AND YOU



Working from the basic principle of optics that the angle of incidence equals the reflection *(left)*, the mirror meatball offers a visual "howgozit" regarding your position on the glide path *(Fig. 1)* above.

is varied by tilting the mirror up or down.

Mirror Principle Easily Shown

A simple demonstration of the mirror principle may be made with a life jacket signal light and a signal mirror to reproduce a "glide path" and to observe how the slope of the glide path may be varied by tilting the mirror.

The mirror glide path angle (and hence its positioning and setting) becomes very important in that the principal governing factor is the hook-to-ramp clearance as the airplane comes over the stern. If you dangle your hook too close to the deck as you come over the ramp you probably made a hairy pass.

If the hook-to-ramp clearance is too great, "you will probably fly over all the wires and breathe a prayer of thanksgiving for Captain Campbell, R. N., the man who invented the angled deck."

A good round number for hook-to-ramp clearance is 10 feet, which for a 27-C carrier will put you down exactly on No. 3 wire, if you are on a 4-degree glide path and if the meatball is exactly in the middle when you cross the ramp—"and stay in the middle right down to the deck."

Comdr. Shepherd's pamphlet assures that "if you are on speed, on the glide path and in the proper attitude at the ramp, you don't have to do a darned thing, except *hold what you've got right down to the deck.*"

The mirror is useless for lining up with the centerline—the pilot must accomplish that himself.

There is, however, plenty of time to get lined up "but don't let it go until the last minute.

"And don't be so attentive as to how you're doing on the meatball that you consider lineup after crossing the ramp—it's too late."

Enter Rock 'n' Roll

Perhaps one of the most knotty problems encountered by the mirror system is the necessity for its stabilization on the deck of a ship. Although stabilization has not been accomplished with respect to the roll effect, the present system provides an acceptably stable glide path for any pitching deck condition which would not otherwise restrict flight ops.

The following general simplification applies to the original forklift mirror used aboard the FORRESTAL and SARATOGA. The stabilization system in the permanent port-side mirror is considerably more complicated.

"If you can imagine the ship sitting dead in a calm lake (with the mirror turned ON) the glide angle would be projected up into the air like a long searchlight beam.

"Now if we rock or pitch the boat, this searchlight beam would sweep all over the sky because the mirror is rocking and pitching with the boat. We would, therefore, have quite a time trying to ride down a beam that was sweeping around like a firehose. A little roll doesn't affect the mirror too much, so let's confine the discussion to pitch:

"If the mirror isn't stabilized, when the stern pitches down, the mirror glide path pitches down right with it. If you were on the beam before she pitches down, you would suddenly get a

Night carrier landing photo illustrates the precise pattern of mirror approach.

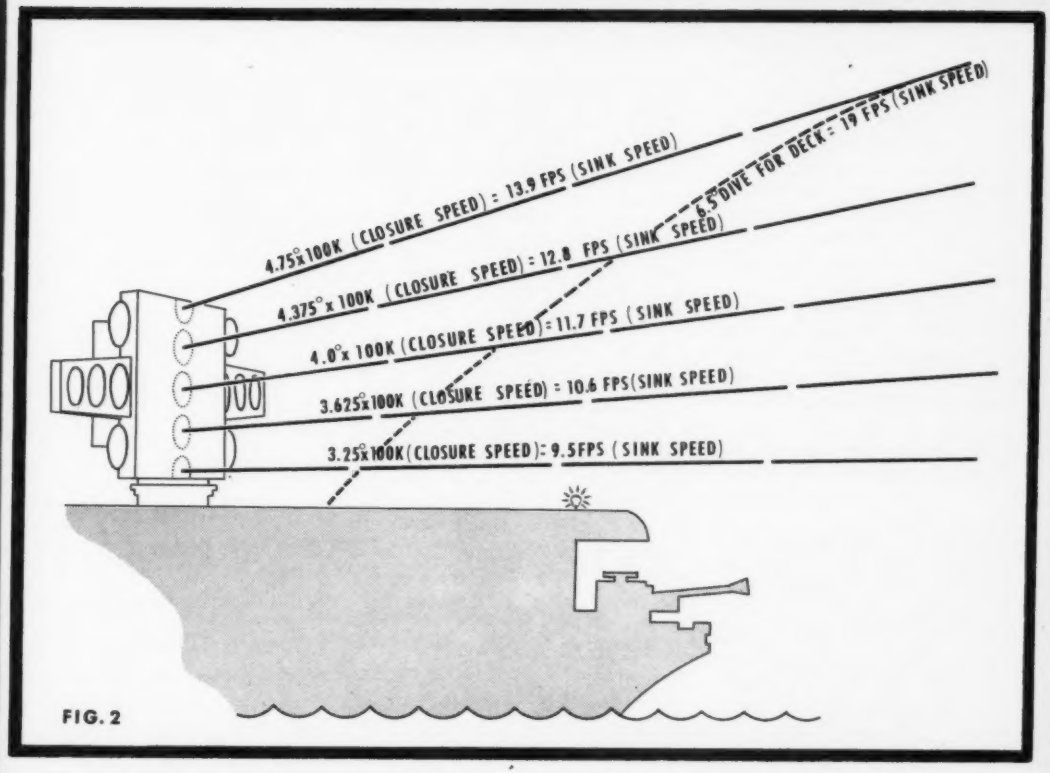

4.75°x100K (CLOSURE SPEED) = 13.9 FPS (SINK SPEED)
4.375°x 100K (CLOSURE SPEED) = 12.8 FPS (SINK SPEED)
4.0°x 100K (CLOSURE SPEED) = 11.7 FPS (SINK SPEED)
3.625°x100K (CLOSURE SPEED) = 10.6 FPS(SINK SPEED)
3.25°x100K(CLOSURE SPEED) = 9.5FPS (SINK SPEED)
6.5°DIVE FOR DECK = 19 FPS (SINK SPEED)

FIG. 2

Typical example of mirror approach problem, using 100-knot closure speed, illustrates unhappy result of attempting to correct late for a high meatball indication. Note that for a relatively small increase in glide angle, the sink rate increases rapidly to an unacceptable 19 feet-per-second and a damage-producing impact with the deck. *(See also Fig. 3, page 18, for translation of sink speed into impact forces.)*

mirror indication that you were high (meatball above the datum lights — because the glide path pitched down below you. The idea therefore . . . is to keep the searchlight beam steady in space regardless of how the ship pitches around."

This is done in the forklift mirror by causing the mirror constantly to change its tilt angle in phase with the pitch of the ship.

By an ingenious electro-mechanical arrangement from one of the stable elements used to steady the ship's radar, appropriate signals are fed into the mirror tilt mechanism which keeps the "searchlight beam" fairly steady with respect to the surface of the earth. Important to remember is that the stabilization system does not change the basic glide angle that has been set in the mirror.

As Comdr. Shepherd says, "the idea of the game is to keep the meatball reflection lined up with the green datum lights—right in the center of the mirror (vertically—and to remember that the lateral position of the meatball (right or left) doesn't mean much."

What Goes In Comes Out

A basic principle of optics says that when a light ray strikes a plane mirror, the ray has to bounce off the mirror at an angle equal to the angle at which the ray struck the mirror (angle of incidence equals the angle of reflection). *See Fig. 1*

Using this principle there remains only the step of computing trigonometrically the desired slope of the glide path which will end up at the target point—normally the No. 3 wire.

Quite obviously, different aircraft models have varied heights-of-eye of the pilot, and require varying mirror heights.

For this reason, the standard mirror installation will provide a rapid change-of-height adjustment to meet these varying requirements.

How to Get Proper Setting

To calculate the proper setting of the mirror, you must know certain factors such as the vertical and horizontal distance between pilot's eye and the hook, and the average approach attitude of the airplane. Knowing this, it is possible to set the mirror height for the proper eye-touchdown-point, which in turn establishes the hook touchdown at the target wire.

Each mirror receives individual installation to "fit" the particular ship, and although the mirror glide path angle control mechanism is calibrated on installation, it is the responsibility of the operators to make geometric checks to insure accuracy,

Zero it in First

If adjustments are to be made, the mirror should be stabilized at zero by locking the stabilizing element source at ZERO, otherwise the mirror is left with whatever error was present at the point of stopping.

The geometric check uses the "checkpole," simply a mirror mounted on a length of pipe, which is set on pre-established paint or weld marks on the deck to visually check proper mirror glide-path angle.

For the pilot, "the important thing to remember is that when you're just about to come over the ramp, and you're holding the meatball a little high or low, you don't have to make all sorts of frantic gyrations to get it back down in the middle.

"In most jets it will take you just about *one second to get from the ramp to touchdown*, so there isn't much you can do about it anyway. In fact, most of my friends who try to make that last second correction only succeed in fouling themselves all up.

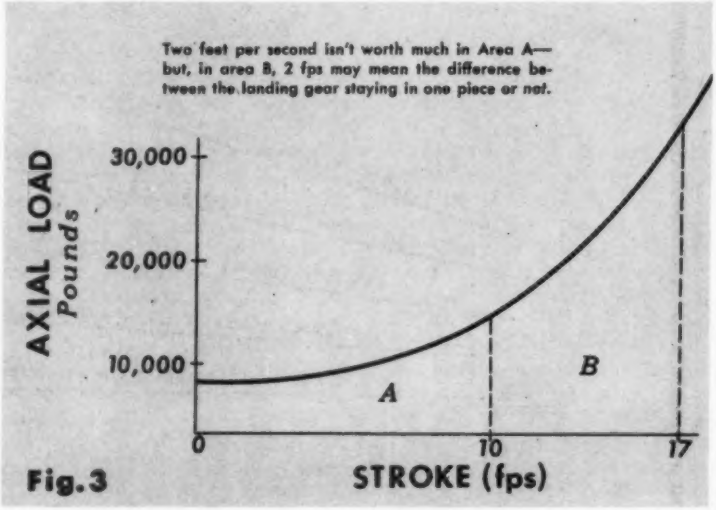


Fig.3

Nix on Late Corrections

"If the meatball is about halfway low, and you're steady, just hold what you've got and you'll wind up on the No. 2 pendant instead of the No. 3.

"If you horse back on the stick you'll probably have a big hairy free-flight engagement, or you'll bounce and bolt—(continue unarrested past the wires to become airborne again for another

approach), or you'll only succeed in rotating the airplane more nose-up than it already is. This only swings the hook down closer to the flight deck which will put you on an earlier wire anyway. *So—hold what you've got and relax and enjoy it!!*

"The same philosophy is just as true when you're high. You'll still get a wire (most of the time).

"You don't have to dive for the deck."

Summing up his advice to pilots, Comdr. Shepherd cautions that:

"(1) If anything doesn't look, smell, sound or feel good—go around again!

(2) If you lose the meatball—go around again!

(3) If in doubt about the distorted image on the mirror—go around again!

(4) Speed control is all up to you—watch it. (We seem to have lots of 'FAB' entries in the LSO's book—if anyone doesn't know what FAB means, consult any LSO.)"

(For more tips on pilot technique in the mirror approach, please see "Test Pilot Tips," next page—Ed)

Because the nature of the touchdown itself is the ultimate criterion of any landing, and because the touchdown is that final point to which the mirror system has functioned, an explanation is required of some of the factors which contribute to the landing itself.

Most important of these factors is that labeled "sink speed," or the vertical rate of descent of the airplane as it comes down the sloping glide path.

It is this sink speed which determines the force with which your airplane will hit the deck, and the problem of keeping sink speeds low is one which has haunted designers and flight test engineers for years.

Sink Speed Factors

During carrier operations on a steady deck, your sink speed depends only on your true airspeed, the velocity of the wind over the deck and the glide path angle set on the mirror. If the mirror is set to a basic 4-degree slope, but you are riding a *steady high* meatball right down to the deck you are actually coming down a 4¾-degree hill. This isn't too bad in itself, but let's assume that you try to correct your "high" just before you get to the ramp. And let's further assume that you succeed in getting the meatball back in the middle just as you touch down. This correction compounds the ¾-degree optical error, and you wind up with a sink speed of from 2 to 5 feet per second higher than you calculated from the charts.

Moral: *Better to stay on the slightly high glide path angle unless you have time to get "steady on" before touchdown.*

Aircraft design must include certain strength provisions which will permit the airplane to hit the deck with an acceptably hard impact—without becoming unduly bent and broken.

Currently, a max sink rate figure for the contemporary family of aircraft is somewhere around 17 fps. With a glide path of 4 degrees, present aircraft may be expected to have a 11-13 fps sink rate. Translate this into landing gear load stroke forces and engineers begin to wince audibly. (*See Fig. 3*).

To this proposition, add Comdr. Shepherd's statement that "Our experience, both with fleet and NATC pilots, is that the sink speeds in about 700 shipboard landings averaged about 2½ fps *higher* (repeat HIGHER) than the (approach speed) curve predicts.

"To me, this means just one thing—and that is that the old devil ***DFD*** is rearing his ugly head again." This increase can also be attributed to last minute efforts to correct a steady high meatball indication.

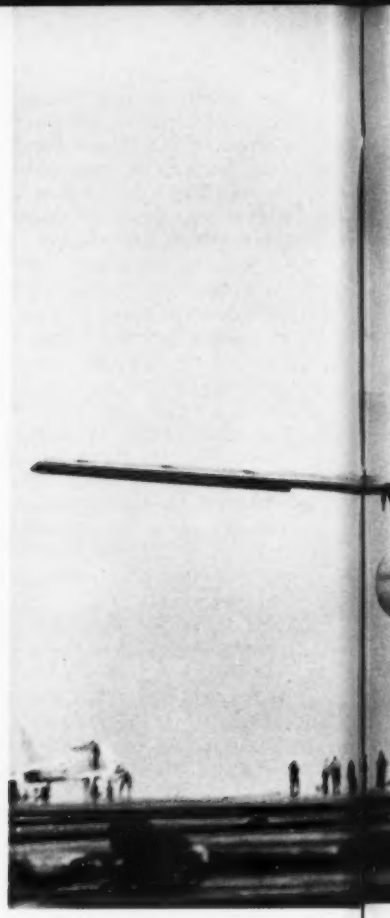
In short, any tendency to dive-for-deck on the mirror approach may easily overstress the airplane.

Same Sad Old Story

The unhappy results of DFD landings may be detected in the mirror landing statistics reported for the second quarter of fiscal 1957.

During this period, the mirror system experienced 27 landing accidents—a fact surprising in itself—and 21 of these accidents were the result either of hard landings or the closely related "collapsed gear" and "airframe failure" type accidents.

(It should be noted that this unusually high number of mirror landing accidents is not regarded by the records-keeper as an indication of continued increase of the mirror landing accident rate, but will probably be reflected only as a fluctuation in an otherwise stable accident rate curve. For example, a possible cause of some accidents might be explained by the recent detection of warped mirrors on several ships.—Ed.)



TEST PILOT TIPS

During a recent conference on the Optical Landing System which was held at Patuxent, NATC test pilots offered their impressions of mirror approaches made on various carriers in several of the "new family" of naval aircraft.

These informal observations are presented, not as official doctrine, but as additional good dope for concerned personnel.

FIRST, regarding general technique, Comdr. Shepherd's "The Mirror and You" observes that "flying the mirror is a lot like flying GCA.

"They always told us the secret of a good GCA approach is to get squared away early in the ball game. This means to get your airspeed down to where you want it, to get lined up with the big yellow line, *and above all to get trimmed.*

"You should come downwind at 450 feet (*this may vary with individual aircraft doctrine — Ed.*) about 5-7 knots above your final approach speed.

If you intercept the glide path, with the meatball right at the middle, at 450 feet on a 4-degree glide angle, you'll be about 5700 feet astern.

"In terms of time, this is about 30 seconds from touchdown — which is just fine!"

At this point, quite often, ". . . most aviators can't stand prosperity! They'll be coming down the hill all squared away—meatball in the middle, all trimmed up, and right on speed . . . This

is a horrible feeling! Something must be wrong—this can't be true!

Don't Be Ham-Fisted

"Well, they start to horse around with the stick and throttle and succeed only in getting themselves all fouled up in the long run.

"If the meatball starts to drift easily and gently a little high or low, make a nice smooth correction using the stick only.

"You don't horse the throttle around on a GCA, so why do it on the mirror."

The F8U

In the *Crusader*, the meatball must be kept right in the center —there can be *no flare* and no dive, else "you might bump the blunt end of the boat." (*See "Flare Not," August 1956* Approach, *for info applying to all of today's carrier operational aircraft.—Ed*)

As in most of the airplanes, speed control is critically important. You can't fly the F8U too fast or too slow—fly the recommended airspeeds closely.

As to port or starboard mirror installation, the F8U project pilot related that, on one ship, an informal poll of "nugget" pilots revealed a relative indifference to the choice of port or starboard location.

There was a similar indifference toward a right- or left-hand pattern choice, although the consensus appeared slightly in favor of a port installation.

A3D

As in the F8U, speed control of the A3D is imperative on the mirror pass.

In general, the A3D pattern was 600 feet altitude downwind at approximately 3-5 knots over optimum approach speed. At the 180, the NATC pilot reported using about a 1 ›-17-degree bank, varying this bank to intercept the glide slope just as the straightaway was entered.

As the straightaway was entered, the speedbrakes were opened to initiate this rate of descent. Continued next page

. . . in general, the *Demon* makes a standard approach on the mirror. . . .

. . . F4D has excellent buffet indication of approaching stall. . . .

. . . as in most of the new family of aircraft, speed control of the F8U on the mirror is important. . . .

. . . test pilots were unanimous in approval of angle attack/airspeed presentations such as this illuminated approach index for use in mirror approaches. . . .

The pilot should watch the glide path on the mirror, the angle-of-attack indicator (when installed), (*described in "Assume the Angle", page 10, Aug. 1956* Approach—*Ed.*) and power setting.

Every effort should be made to match power and angle of attack. The no-flare landing technique is employed. Waveoff characteristics are outstanding with both engines operating.

The angle-of-attack indicator, with which Pax aircraft were equipped (Specialties, Inc. Type B-3 with cockpit indexer) was regarded as an excellent instrument and the primary means of speed control during the carrier approach.

On single-engine operation, at weights of 46,000 lbs and under, at a 500-700 fpm rate of descent, the descent can be stopped in 100-125 feet upon application of full throttle while maintaining an observed airspeed of 130 knots. A climbout can be made at 300 fpm with gear and flaps down. Speedbrakes are not used on single-engine operations.

F4D

For a configuration which included external tanks, the F4D pattern was about 3000 yards

abeam at 500-600 feet at about 140 knots downwind. The mirror was picked up between the 45- and the 30-degree point.

In the final part of the turn it was quite easy to lose the necessary 3 to 4 knots down to about 135 knots (this varied with weight of aircraft of course).

Pilots, it was emphasized, will have to know gross weights and fuel weights to establish proper airspeeds for the load condition.

The pilot must be conscious of the angle-of-attack attitude at which the airplane contacts deck — a nose-high attitude often makes a free-flight engagement.

Again it was remarked that the angle-of-attack indicator is an excellent aid which offers a simpler instrument scan pattern.

If the meatball is picked up slightly low, corrections should be made promptly or a waveoff taken.

There were suggested two ways of landing the *Skyray*: (1) tail-low; and (2) to ease the nose over as the airplane is ready to contact the deck. *This latter method was* not *recommended until the pilot is completely familiar with the aircraft.*

The F4D demonstrates a lateral directional oscillation at low speeds which produces a large amount of adverse yaw in turns. This can be overcome by the use of the rudder, and all small corrections should be made with rudder. The airplane has excellent buffet indication of approaching stall.

For waveoffs, it is necessary to get power on early. The yaw damper is engaged on the approach.

One objection to the mirror approach, with respect to the F4D was that lower power used on the glide path results in poorer control—but there was an additional advantage and comfort of a 600-foot pattern in night approaches.

The test pilot observed that the F4D actually seemed easier to fly on the paddles than on the mirror, possibly for the reason expressed above.

To this can be added a squadron commander's caution against attempting any flare on landing the F4D. Landing attitude of the airplane is highly important as any tendency to flare results in possible damage to the tail bumper and fuselage.

(*Additional information on F4D carrier approaches may be found in the Douglas F4D Service Information Summary of February 1957 which quotes the most recent revisions to the F4D flight handbook.—Ed.*)

F3H

In general, the *Demon* makes a standard approach. On downwind, the F3H should be flown approximately one unit lower (3-5 knots higher airspeed) than optimum final approach angle of attack. A gentle turn is then made to intercept the glide slope at an altitude of about 500 feet.

Particular attention should be given to speed control during the entire approach, matching power with the angle of attack required. The no-flare landing technique is employed.

At heavier gross weights (27,000-30,000 lbs), a late waveoff would probably be impossible to achieve because of thrust/weight ratio and high (up to three seconds) afterburner light-off time.

Operational Comments

To these reports are added two comments by operational commanders on general technique in mirror approaches:

From an Air Group Commander:

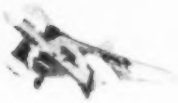
"The mirror landing system, even with its present stabilization inadequacies, will permit operating under more adverse deck conditions than will the paddles approach system. However, in flying the mirror approach path to a pitching deck, the pilot must be even more careful to avoid 'flying the deck' than when making a paddles approach, since on the mirror glide path the pilot has already established his proper rate of descent prior to reaching the ramp, and even a slight dive to compensate for a falling deck can produce greatly increased rates of sink."

From an Air Task Group Commander:

"The proper technique for mirror approach and landing aboard ship by those pilots who consistently make the best approaches and landings on this system is . . . concentration on attaining the proper position at the 90-degree point; concentration, lineup and airspeed upon entering the groove; lineup, airspeed and meatball down the groove; then short of the ramp with lineup assured, full attention over to meatball until the landing is effected.

"At this latter point, attention is taken from airspeed completely, contrary to everything a pilot has ever been taught. This practice is not as dangerous as it may appear to be, since the best mirror approaches are flown at airspeeds approximately 5 knots faster than LSO-controlled approaches, thereby allowing the pilot a margin of safety. . . ."

MORE TIPS FOR PILOTS and LSOs



By

Lt. James

Lyons

- The mirror places more emphasis on the need for pilot to fly his own approach.
- At night, there is a vast improvement in that the meatball can be spotted several thousands of feet out—even to a couple of miles on some nights. The lighted paddles and suit were severely limited in this respect under many conditions of weather . . . Now the pilot can spot needed changes in his glide path more quickly plus having that very comfortable additional 200 feet of altitude at the beginning of his approach.
- It is much easier for the pilot in his transition from CCA to LSO control and, therefore a great benefit all-weatherwise because of this ability to pick up the mirror farther out in the approach.
- There is much more latitude allowable in the approach angles to the ramp. It really doesn't matter whether it's a right- or left-hand approach, though the left-hand one is preferred in that the traffic pattern is easier to sight control.
- Waveoffs must be given earlier in the final in order to be safely effective in this power-glide type of approach.
- After the pilots have a little experience on the mirror, they tend to leave the mirror too early in the game and continue on to the touchdown without the benefit of the meatball.
- A little experience also seems to result in a tendency to start low, thereby picking up the meatball late in the final, and, in setting up the descent they go over the top and bolt.
- Those new at the mirror tend to start too fast and ease the power on the way down, which leaves them dangerously slow by the time they reach the ramp.
- If the sun is within 20 degrees of either side of the glide path, it becomes difficult to distinguish the meatball in the reflection that results.
- The speed is more difficult for the LSO to monitor in this descending approach with the oftentimes dubious accuracy of the SPN-12.
- Good indoctrination of the prop pilots is necessary to motivate them to watch for the cut signal.
- The waveoff is not always easily spotted by the pilot when his scanning of airspeed, lineup and the position of the meatball is not done properly.
- Also recommended, whenever possible, is the practice of monitoring closely engine RPM during mirror FCLP and carrier passes (when you can look). For example, if you are used to carrying 86 percent for a given fuel weight and someday find it takes 94 percent to hold speed and attitude, something's wrong.
- With airspeed system difficulties of any sort, the pilots may be instructed to resort to the old "paddles" approach because of the relatively ineffective method of radio monitoring by the LSO. It is because of this that the control of the approach by the LSO is severely curtailed thus limiting his ability to coach the pilot out of difficulty. It has been suggested that the LSO be provided a radio that will cut out other transmission on that frequency when it's necessary to step in to prevent dangerous situations from developing.
- The proficiency of the LSO in paddlework is cut below the minimum safe requirements. It must be kept in mind that situations will arise from time to time which would make the use of paddles preferable or even mandatory—e.g. breakdown of the mirror, airspeed indicator difficulties in the aircraft. . . .
- During dawn and twilight and particularly at night, careful adjustment of the light intensity must be made to provide the optimum setting for different light conditions.
- Keeping the flight deck crew away from the mirror can be a major problem without the full cooperation of the ship's company. Tired bodies leaning on it while the stabilizer is in action, those ducking away from jet and prop blast behind it and the would-be Charles Atlases or face squeezers demand constant vigilance to keep it reasonably clean or clear when an approach is being made. We've even caught some playing skip rope with the tie-downs.
- We've found that keeping the wind over the deck between 30 and 40 knots is much desired in that bolters are kept to a minimum. Too much wind results in the pilot actually flying a flatter glide path, and when using the normal airspeed—power relationship, he tends to get slow. This is a perfect set up for an "over-the-top" bolter. Conversely, with low wind over the deck a normal power setting may be excessive, with pilots flying a somewhat steeper glide path.

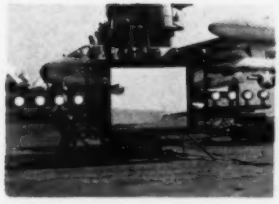
. . . the mirror doesn't provide a means for lineup. . . .

PROBLEMS

RARELY does a new device or technique lend itself to immediate and complete integration in the system for which it is designed, and the mirror is no exception.

As in many instances, the general application of the mirror encountered a number of problems—of varying significance.

For example, the mirror, as has already been established, does not provide a means of lineup with the flight deck. This shortcoming is not regarded as particularly troublesome, however, as pilots have demonstrated their ability to establish their own lineup with visual reference to the deck.



Prototype installations posed handling problems . . .

Pitch is the Witch

In general, mirror approaches appear to be most vulnerable to (a) the pitching deck, *stern down* situation, wherein the glide slope is stabilized with reference to the *horizon*, but the sink rate is occurring with respect to the *deck*—with a hard landing likely to result; (b) the *stern high* situation where the decreased hook-to-ramp clearance presents its obvious problem; (c) the effect of ship's *roll*—to compensate for which is even more difficult than pitch.

(*An additional consideration, that of the problem of low ceilings, includes the necessity for a ceiling of about 250 feet to permit a minimum of 15 seconds on the mirror—Ed.*)

Similarly, with respect to field use in low visibility conditions, it has become almost axiomatic that "if you can't see the runway, you can't see the mirror."

It will quickly be perceived that the pitching deck situation automatically requires the use of the LSO to: (a) attempt to monitor a simulated mirror glide path approach—in which the LSO attempts to detect speed and altitude changes, or (b) have the pilot revert to a flat pass in the conventional LSO manner.

(Navy LSOs feel that in such situations, as when the mirror becomes inoperative, pilots should not go back to the relative unfamiliarity of the flat LSO pass, but attempt a mirror-type

approach with monitoring assist from the LSO.)

LSOs Continue to be Vital

This situation in turn becomes aggravated as increased use of the mirror makes for fewer LSO type approaches, with what has been described as a consequent "degeneration" of both LSO proficiency and pilot proficiency in the conventional, flat approach.

Reports from type commanders are unanimous in the expressed need for some central source of trained LSOs.

In an effort to cope with this problem, there is contemplated a "landing safety officer," somewhat similar to the British "mirror monitoring officer." This individual will augment the mirror information with appropriate visual and radio signals.

Pitching Deck Techniques

Included in one accident board report (involving an early prototype mirror having limited stabilization) is this description of a manner in which the LSO may be used under pitching deck conditions:

"To combat these undesirable (pitching deck oscillation of mirror) indications, it has become common practice for the pilot under pitching deck conditions to fly a standard mirror approach, attempting to average the oscillations of the glide path, if possible.

"The controlling LSO gives altitude information over the land/launch radio circuit to aid the pilot in reestablishing his glide path if it becomes erratic or erroneous.

"The pilot is thus encouraged to refrain from attempting to chase the deck. The LSO advises the pilot, if necessary, as to the technique to employ near the ramp, i.e., if the deck will be up,

Mirror glide path information may be augmented by visual and radio signals from LSO *(below)*. Even on the mirror, "dat ole debbil" dive-for-deck can produce major damage such as this broken main gear on Cougar (right).

the pilot is advised to slow his rate of descent."

Operationally, the mirror is subject to effects of distortion, rain and condensation, reflected sunlight and sea-glare, and soot and spray deposit from the stacks—with obvious reductions of efficiency.

Mirror fogging now being experienced is believed to be eliminated with the addition of a heater for the mirror.

This has been tried on the LEXINGTON.

At present, because of an initial shortage of trained personnel, there exists a certain amount of difficulty in troubleshooting the mirror mechanism. This problem is being dealt with by Op-56 and should be solved as an adequate training program gets under way.

There is a definite need for standardizing the procedure for setting and resetting the mirror, and this information will be incorporated in appropriate CNO instructions and in "Recovery Bulletins" (similar to Catapult Bulletins) which provide a relatively new type of information, in the nature of canned settings, and include tables of optimum settings for the various classes of carriers.

At present, most of the information on the mirror is contained in Operational Development Force reports, and NADC, Johnsville, Pa. reports and in less fomal sources such as Comdr. J. T. Shepherd's "Mirror and You" pamphlets (Vol. I & II), the latter being a compilation of dope assembled in BIS carrier suitability and mirror evaluation experience by the Flight Test Division of NATC, Patuxent.

The expressed need for a direct system of communications between Pri-Fly and the mirror operator and the LSO is also receiving attention, together with BuAer's plans to locate a central control panel in Pri-Fly—including a waveoff control, intensity control and mirror elevation control. The LSO retains cut and waveoff control.

Speed Control Still Problem

A major consideration of the mirror approach, *speed control*, still lacks a satisfactory answer.

NATC pilots, without exception, strongly favored the angle-of-attack indicator as a necessary part of the mirror approach —when and if all carrier aircraft were so equipped.

For the present, proper airspeeds must be responsibility of the pilot. Integration of the SPN-12 gear with the mirror is not contemplated.

It is of interest that VX-3 pilots report excellent compatibility of the mirror glide path with the GCA path.

The Gent Behind the Stick

Several human factor problems have been indicated in mirror experience to date.

One comment notes the occasional surprised reaction of "old hand" pilots who encounter the FORRESTAL class carrier for the first time.

With the first arresting wire located well over 100 feet up the deck, and with practically nothing but flight deck in sight at the cut point on the big ships, there seems to be an immediate thought of "I must be 'way up the deck! Get down!" with obvious hard landings often resulting.

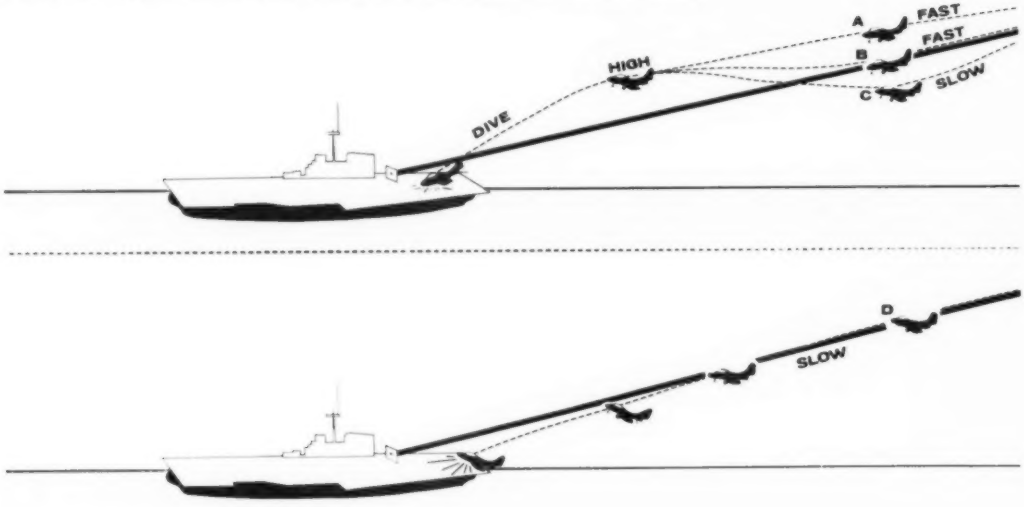
Reported also was a possible tendency of pilots to "cheat" on the low side of the mirror glide path when, say, a low fuel state exists, and a positive wire engagement is desired.

Related to this unhealthy practice are continuing reports of a number of pilots *not* riding the meatball (despite their voice reports to the contrary) but rather flying their own glidepath with little or no reference to the mirror indication. (*It is now understood that a defective mirror may have caused this.—Ed*)

And, finally, there has been an almost universal tendency for pilots to come in excessively fast because of inadequate speed monitoring from the outside as was provided in the LSO pass.

This latter weakness seems to have resulted when the removal of the "fences" on the angled decks reduced airspeed consciousness of pilots.

Mirror-accident statistics indicate that trouble does come in threes—the most frequent sources are listed here. Typical accident briefs (below), show how troublesome situations develop.



THREE FOR ALL

SPEED CONTROL MAJOR CAUSE OF MIRROR LANDING ACCIDENTS

To date, the mirror landing accident picture indicates three principal types of error-of-judgment-and-technique situations which have occurred often enough to warrant definition and discussion.

Type 1

In the first situation, the airplane is on glide slope, but begins to get slow, and a high sink rate follows as the pilot raises the nose in an attempt to remain on glideslope.

Result: A hard landing or possible ramp crash.

Cure: Correct early or take a waveoff.

Example: **FJ-3 commencing a mirror landing approach which appeared normal in all respects until the airplane was approximately 300 feet behind the ramp, *the rate of descent of the aircraft was noticeably increased.* The LSO gave the pilot a waveoff by use of the mirror waveoff lights. However, no indication of a power increase was noted and the aircraft settled into the ramp in a nose-high attitude. The main landing gear struck the ramp, driving the struts up through the wings; both drop tanks sheared, and the tailhook caught and broke the taffrail at the bottom of the round-down, after which the airplane slid up the deck to engage Nos. 1 and 3 pendants.**

Type 2

This second type, high and fast, seems to be difficult to correct quickly. As a result, the pilot finds himself high at the ramp position, and dives for the deck in an effort to engage a wire.

Result: Hard landing.

Cure: If the high-fast situation is not detected and corrected early, take a waveoff.

Example: **F9F-8 on a second approach; the pilot engaged the glide slope with an airspeed of 127-130 knots. "The approach appeared normal though slightly high on glidepath and *accelerating* slightly as the aircraft neared the ramp. The pilot lowered the nose as he passed over the ramp *to compensate for the slightly high meatball.* A harder-than-normal landing followed, and the port gear collapsed.**

Type 3

In the third category, the pilot attempts to make a late correction, say from a low meatball indication and the end effect is to "go over the top" after which a dive-for-the-deck invariably occurs.

Similarly, a late correction from a high position merely shortens the path to the flight deck, with a *hard landing* resulting.

Cure: The *only* late correction should be a waveoff.

Example: **F9F-6P on the pilot's third mirror-assisted approach, the early part of which "appeared good in every respect," with an airspeed of about 125 knots, as the aircraft approached the ramp the pilot raised the *nose in an attempt to correct for a mirror-indicated low.* This alteration of the flight path resulted in a slight over correction, and consequently the airplane was slightly high at the ramp. The pilot then nosed the airplane over and dived for the deck in an attempt to engage a wire. With an excessive rate of descent, the pilot was unable to flare sufficiently to prevent a hard landing which broke off the starboard wheel.**

AND THE FUTURE?

THE future of the mirror landing system, as viewed by many observers of the naval aviation scene, appears even more promising than its initial results indicate.

Perhaps the most concrete evidence of this belief is the program of the Chief of Naval Operations to incorporate the mirror system into a Navy-wide shorebased installation.

At a recent Patuxent conference on the mirror, a representative pointed out that CNO regards the mirror as vitally important, not only from the viewpoint of the training afforded by the mirror, but as a *safety* measure.

Accordingly, there is already underway an air station mirror installation program which has as its ultimate goal the provision of a permanent optical landing system on all active landing runways of all principal Navy and Marine Corps air activities.

Specifically this includes 19 AirPac (ConUS and overseas); 23 AirLant; 22 CNATra, and 3 special stations.

(Certain air stations which are occupied by the Navy in a "tenant" or temporary status, will receive trailer-mounted units as they become available.) Permanent installations will include a glide slope indicator (mirror), power and communication cables and a tower control system, with waveoff control at both the tower and landing wheels watch stations.

For this purpose, funds are being requested in the 1958 budget to provide about 24 air stations with one or two units each. A breakdown of these stations include: ComAirLant 12, AirPac 8, CNATra 4 and Reserve air stations 8.

Meantime, 20 trailer-mounted units have already been distributed to fleet training activities to provide needed shore-based training preparatory to shipboard qualification.

Augmenting the mirror glide path information is a complementary device, sometimes referred to as the "hear-see," which is presently under development. At present in the "breadboard prototype" stage, the device produces a signal "beep" in the pilot's earphones to give an aural indication of his speed. The beep signal becomes annoying as excessive or minimum speeds are approached. The information source may be selected from either the airspeed or the angle of attack source, and can be used in conjunction with the visual "traffic light" angle-of-attack indicator now under evaluation.

Evaluation quantity production of the hear-see device is estimated to be available by June.

Also unveiled at the Patuxent conference was a possible successor to the present mirror installation.

This device, referred to as the "lens system," offers a glide path indication identical to the present mirror but differs in that it is a projection system requiring no source light or large mirror.

Recently, a BuAer representative inspected a device designed by the Naval Aviation Safety Center for possible use at field installations until mirror units become available.

This device consists of a horizontal row of 12 green lights with a 3-foot gap in the middle. Fifty feet behind these lights is a red light cluster. A line through the middle of the red cluster and the row of green lights will form a 3½-degree glide path to the runway.

Set close to the runway, the device resembles the mirror and is used in the same manner as the mirror. If the red meatball is high, you are high; if it is low, you are low. However, the red meatball will still show if you are well off the glide path, and in this respect, the device differs from the mirror. Initial local flight evaluations in the F9F-8, F4D, F7U, FJ-3, F3H, TV-2, TF and AD-6 aircraft were regarded with considerable approval by the pilots.

MIRROR REFLECTION

"Recent rough weather operation of two angled deck carriers together, one with and one without the mirror system has proved beyond a doubt that the method of recovery is the controlling factor in rapidity and safety of operations under these conditions . . . The mirror system as operating now is considered to be a great step forward in naval aviation."—*Commander, Task Force SEVENTY-SEVEN*

Truth and Consequences

A DIGEST OF SIGNIFICANT AIRCRAFT ACCIDENTS

FEATHERING ERROR—Five minutes after takeoff the pilot of an AJ-2 called the tower and reported he was aborting the hop due to extremely high oil temperature.

When questioned on the existence of any type of emergency, he replied, "not yet." Two minutes later — though the aircraft was overweight—he requested an immediate landing, and when asked if he was declaring a deferred emergency, his reply was "affirmative."

The gear was DOWN when the plane turned on base leg at the 180-degree position. The bombardier called, "We're losing our port engine; standby." In the cockpit an inter-crew conversation on the tower frequency followed. Although the words were garbled on the tape recording, the tower operators were later able to interpret them.

The flight path and crew conversation were reconstructed approximately as follows:

At the 90-degree spot in a shallow angling bank: "You want flaps?"

"Affirmative."

Turning on final: "You gonna feather it?"

"Right." (*this interpretation is unreliable due to garble*).

The next positively identified transmission was at the 45-degree spot when the bombardier asked, "Want me to take another look?" Coincidental with this transmission, the aircraft leveled its wings at an altitude of about 400 feet. At this point, with the plane nearly a mile from the runway, a steeper angle of bank would have been required for a proper lineup with the runway. The board speculated that the pilot, once he suddenly realized he was overshooting the wind line, had attempted a waveoff.

Witnesses reported smoke trailing from the port engine. It was also noticeable that considerable jet power was being used.

The aircraft then assumed a nose-high attitude while losing altitude. Eleven seconds after the pilot leveled the wings he transmitted four "Maydays" in a highly agitated voice. The plane struck several tall pine trees before making contact with the ground, then burned.

The squadron skipper declared: "The pilot involved was regarded as one of the best plane commanders in the squadron. He was smooth and steady. His reactions in an emergency would have been predicted as the best. His experience in the last six years of about 1500 hours was almost totally in twin-engine type aircraft and was accident-free.

"Nonetheless the starboard propeller was observed by a competent witness to be feathered just prior to landing, and was found to be feathered in the wreckage.

"It is difficult to understand why the pilot delayed his decision to feather. Hindsight shows it should have been made while he still had altitude, time and airspeed.

"In view of the evidence, the best conjecture that can be made is that the pilot accidentally reached for the wrong feathering button under the stress of worsening conditions. Once feathered, it was too late to unfeather."

During the investigation certain facts were brought out which led the board to believe that the bombardier unstrapped himself and left his seat to look at the port engine. A witness said he saw three persons on the port side of the aircraft seconds before the crash; it should also be noted that the bombardier was found unbuckled and unhelmeted.

The occurrence of this last described act—which was likely—seemed to have contributed directly to the feathering error. Furthermore, such factors as the bombardier's height—6 feet 4 inches—and the small space of the cockpit were contributory—because the bombardier, in moving from his seat to peer out the

port side, found himself within the area of the pilot's right hand and the center console.

As the accident board stated: "With the bombardier standing between the left and right seats, leaning over to look at the port engine, access by the pilot to the landing gear and flap controls was very likely obstructed. There is no question that the bombardier's movements generated confusion in the cockpit and distracted the pilot.

"Amidst the distraction of the bombardier's movements and the impact of a sudden realization of the necessity for 'going around' the starboard feathering button was inadvertently depressed."

The board recommended that all pilots be reindoctrinated with the basic essentials of coping with in-flight emergencies, with emphasis on the following:

(a) Review aircraft performance with one engine secured;

(b) Due to good performance of this airplane at all weights with one engine secured, accomplish securing of an unreliable engine at a safe altitude;

(c) Where loss of one engine is suspected, or is imminent under high gross weight conditions, immediate consideration must be given to weight reduction by jettisoning; and

(d) Once committed to an emergency landing approach, the pilot should concentrate on his approach to a successful landing on the runway above all other considerations.

CLOSE SUPPORT—A first lieutenant who was a restricted helicopter pilot was assigned as pilot of an HRS for a night airlift utilizing external baskets for cargo. He had 134 hours in the HRS, a total of about 800 hours, and had been a naval aviator for two years.

The copilot was a Marine captain who had been a designated aviator for 13 years and had 3400 total flight hours. His time in the HRS totaled 42 hours, all flown within the previous three months.

On the first run the copilot was at the controls and a left-hand approach to the drop site was begun from about 500 feet above the ground. When about 100 yards from the target the pilot noticed the approach was getting too low and he motioned the copilot up. Before positive action could be taken, the external basket hit the ground and the aircraft was damaged when it settled on the basket.

When he realized the aircraft had hit the basket, the pilot took control and landed. Damage was not sufficient to cancel the airlift and operations continued without further incident.

Landing lights were not to be used on the mission if safety of flight permitted since this was a tactical mission and the use of lights would defeat the purpose of the problem. Approach lights were available in the squadron but were not used, however the accident board noted that missions of this type have been successfully flown without utilizing these lights.

The board recommended that approach lights be used in all instances where possible on missions of this type.

On his endorsement to the accident report the commanding officer stated: "that pilots in command have been instructed to take control of the aircraft on at least the first approach and landing when going into unfamiliar terrain, and further, to take positive action when a copilot is entering a dangerous situation rather than waiting until it has developed."

On a practice support mission, similar to this actual Korean ammo drop, an HRS pilot of limited experience got into trouble.

Continued

Truth and Consequences

MID-AIR—The accident occurred on a ferry flight of four new T-34s. The pilot in charge of the flight detected an error in his magnetic compass of about 25 degrees; so he passed the lead to his wingman, who was having radio transmitter difficulties. This system worked satisfactorily to their first fuel stop.

After refueling, the four planes took off again, without attempting to correct the distracting discrepancies in either of the two lead-section aircraft, and without putting one of the other two aircraft in the lead position.

Approximately 15 minutes prior to reaching refueling stop, the pilot in charge of the flight moved up to check navigation with the lead plane, preparatory to changing the lead. During the exchange of hand signals, the senior pilot in the wing position was flying slightly stepped-up. He momentarily lost sight of the lead plane, and attempted corrective action by pulling up.

The left wingtip of the wingman's plane knocked the vertical stabilizer and rudder off the lead plane which went into an uncontrollable dive. The pilot bailed out successfully.

The plane which caused the collision was landed without further damage. Its pilot later stated:

"I believe that this accident could have been avoided through more alertness on my part in maintaining position and by eliminating conditions such as the compass error and communication difficulties, which in this case necessitated a lead change."

GO, NO-GO—This pilot took off in an FJ-3 and executed a jet limited instrument departure, up to 4500 feet, when a loud noise in the engine was accompanied by a loss of thrust and severe vibration.

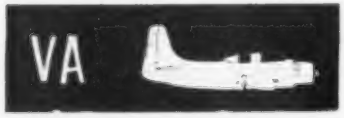
The pilot correctly diagnosed the trouble as turbine wheel failure and secured the engine. He then elected to abandon the aircraft, positioned his body properly and pulled the face curtain. The canopy was jettisoned but the seat failed to eject. The face curtain was pulled 5 or 6 more times but the seat did not fire.

At this point, the pilot decided to abandon the airplane *by going over the side.* The plane was in a shallow nose down descent, 250 knots and approximately 3500 feet high. The pilot unfastened his safety belt and shoulder harness and attempted to stand up in the cockpit. Windblast and the weight of the parachute made his attempts unsuccessful. (The Flight Handbook for the FJ-3 states that all bailouts should be accomplished by means of seat ejection.)

The pilot next thought of actuating the emergency safety pin extractor handle, but due to the low altitude and airspeed, he decided to remain in the plane and attempt a forced landing. He selected a landing site and made a good approach, flare and touchdown. Speed on impact was estimated at 125 knots.

As soon as the airplane touched down, the pilot braced his arms against the top of the instrument panel and remained in that position until the plane slid to a stop. The shoulder harness and safety belt, unfastened during the bailout attempts, had not been refastened.

The pilot received two lacerations over the left eyebrow, each approximately three inches in length, sustained when his forehead struck the mirror. The airplane was a strike.



LOW AND SLOW—The pilot of an AD-3Q had no communication with his carrier and as the ship turned to a recovery course he flew by the starboard side in a normal upwind approach to the pattern. While passing abeam the pilot rocked his wings to indicate the lack of communications.

A normal turn to the downwind leg was commenced forward of the bow as the carrier steadied into the wind. But, at the 180-degree position the aircraft appeared to be only about 500 yards abeam, closer than normal. The turn off the downwind appeared to be normal but as the turn continued the plane assumed a slightly nose-high attitude and the angle of bank increased to approximately 35 degrees. Near the 90-degree position of the approach, a spin to the left ensued. The plane entered the water inverted and the one passenger was not recovered.

Referring to the Pilot Operating Instructions for the AD-3Q,

the stalling speed for the approach was determined to 87 knots CAS. The pilot had extensive experience in AD-5s but only 5.3 hours in the AD-3Q. The accident board felt that the lighter feel and greater maneuverability of the AD-3Q deceived the pilot in the approach.

This opinion was supported by the fact that he said he observed an airspeed of 88-90 knots shortly before the stall, but took no corrective action. This indicated speed was the actual stalling speed of the aircraft under existing conditions.

The pilot proceeded upwind along the starboard side of the ship while it was still turning to the recovery course. Although this is an accepted practice, it is incumbent upon the pilot to make suitable heading adjustments to permit a safe turn from the 180-degree position to the ship.

This was not done, with the result that the landing approach commenced too close abeam. Having elected to continue in an approach from an undesirable position the pilot then failed to maintain the additional airspeed required by his excessive angle of bank.

In the conclusions of the accident report the board emphasized the following points:

(a) Don't attempt a tight turn to save a poor approach, go around instead.

(b) Know the stalling speed of the *particular* aircraft you are flying under all flight and load conditions. When necessary, carry a knee-board card with appropriate data and plan each approach in advance.

(c) Require all pilots operating aircraft with any malfunctions to take additional time to ensure that conditions are stabilized prior to entering the carrier landing pattern.

A review of "Tangle with the Angle," Jan '57 Approach, *and the AD stall/spin picture, April, 1956* Approach, *may also be in order.—Ed.*

wheels up SAVES

WHEEL WATCH SAVES FOR FISCAL 1956 AND 1957

NAS, MIRAMAR
San Diego, California

Name	Rate	Activity	Model Aircraft	Date	Equipment Used	Previous Saves
		1956				
L. R. Renshaw	ATAN	VF-51	F2H	Jul 5	Flares	0
*H. S. Spear	AC3	OPS	F4U	Jul 14	Radio	2
D. K. Loupe	ADAN	VF-53	F4U	Jul 14	Flares	0
W. L. Ruppell	AOAN	VF-54	TBM	Jul 26	Flares	0
P. J. Reynolds	AT3	VF-54	AD	Jul 29	Flares	0
*R. C. Bennett	AC3	OPS	AD	Jul 29	Radio	0
G. P. Fredrickson	AE3	VF-114	F9F	Aug 15	Flares	0
R. S. Ray	AM3	VF-114	TV	Aug 18†	Flares	0
*R. B. Carter	AC1	OPS	AU	Aug 24	Radio	2
*R. B. Carter	AC1	OPS	AD	Nov 1	Radio	3
D. D. Buffington	AM3	VF-123	F9F	Dec 9	Flares	0
		1957				
*J. T. McGillicuddy	AC3	OPS	AD	Jan 23	Radio	1
*E. A. Lane	AC2	OPS	F7U	Feb 15	Radio	0
*D. D. Hartwick	AC2	OPS	F9F	Mar 7	Radio	2
D. G. O'Dell	AA	VA-146	F9F	Mar 2	Flares	0
C. D. Bernard, Jr.	AA	VA-145	F9F	Mar 23	Flares	0
C. D. Bernard, Jr.	AA	VA-145	F9F	Apr 3	Flares	1
O. L. Greenfield	AA	VFP-61	FJ3	Apr 19	Flares	0
E. L. Moore	AD3	VF-124	F9F	May 11	Flares	0
*R. B. Carter	AC1	OPS	AD	May 16	Radio	4
*E. R. Henderson	AC3	VFP-61	FJ3	May 29	Radio	0
D. E. Becker	AM3	VA-116	F9F	Jun 1	Flares	0
*M. D. Clayton	AC1	OPS	AD	Jun 5	Radio	0
*C. M. Thompson	ACC	OPS	F7U	Jun 8	Radio	0
J. Montoya	AD3	VF-123	FJ3	Jun 12	Flares	0
L. E. Shipman	AO3	VF-121	FJ3	Aug 14†	Flares	0
E. B. Collins	AM3	VA-146	F9F	Sep 28	Flares	0
*E. A. Lane	AC1	OPS	AD	Nov 7	Radio	1

(*Tower Saves)
(†Night Saves)
All of the above saves occurred as the planes were approaching for a normal landing.

Please see APPROACH, *October '56, page 40 for details on submitting recognition for individuals who have successfully prevented unintentional wheels-up landings.—Ed.*

GUARD GUARD PLEASE

Why not make one of the tactical channels a "catch-all, radio check, chit chat, mickey-mouse frequency"? Let's make it button 7 and set up 243.0 mcs as the frequency.

Then we can go to the position marked "G" and set up an emergency frequency one can guard without becoming deaf. The frequency of 243.0 is a fiasco paralleled in confusion only by 255.4.

Let's avert an accident—the one where the pilot can't be warned because he turned off guard in order to be able to read other frequencies.

Complaints on guard violations are mounting. Approach *would like other suggestions.* —*Headmouse.*

ON SECOND THOUGHT

"I was taxiing toward the duty runway when I observed a wheels-up approach of an F9F-8. For the pilot involved, I'll mention that the wheel watch fired a flare after the aircraft had passed the end of the runway.

"My advice to myself and other pilots in the future is to broadcast a waveoff when any doubt exists as to position of the gear of an aircraft on final. If I had spoken up I could have saved him—and the Navy—a lot of trouble."

HAZED BUT GOOD

"It was a hazy afternoon as usual in the Atsugi, Japan area. I was in an AD-6 on a low-level nav hop, and returning to Atsugi on the last leg of the problem, everything seeming normal. My wingman and I had been flying over the mountains for about an hour and a half. We had dropped rather low in a wide valley and had plenty of time to start our climb up the next ridge of the mountains.

"They didn't appear to be too high; so I went chugging along and ascended at cruise power. As I approached the mountain and neared the top I realized my speed was decreasing and I was in need of more power than I had been using.

"The distance was closing rapidly and I still had several hundred feet to climb. I popped the flaps to the full down position in hopes that I could steepen my angle of climb and slow my forward speed down enough to make it over. At this time I began to see that the chances of making it were getting pretty slim but I was too slow to do a wingover or a steep turn to get out of this situation.

"All I could do was to put all the power I could get and pray. Last time I looked at the airspeed indicator it read about 95 knots. I just hoped that I wouldn't get a downdraft now. It looked as if I was almost sure of hitting—so I looked skyward.

"Out of the corner of my eye I could see trees whiz past my wingtips and expected to feel the jar of collision with the top of the mountain. For a minute, it seemed, I waited and nothing happened. Then I could see the valley below

and realized that I had been spared my life.

My wingman was a quarter of a mile ahead of me and he made it with little strain. Why had this happened? Primarily it happened because I had not checked the altitude of the mountains previous to crossing them. I had flown the low-level route once before and thought I knew it well enough to just judge the heights. The haze gives a deceptive view of heights and distances.

"I've resolved to make every hop a thoroughly briefed and studied affair. After all, we are supposed to be professional pilots."

BRAILLE SYSTEM

"How many times I've read and chuckled over Anymouse and his 'hairy tails' with never a thought in my head (2nd Lt. type; 1 ea.) that I might one day be the author of a like 'tale.'

"While our squadron of F3Ds was taking part in a fleet exercise I found myself, after a mad dash, hurriedly strapping myself to my plane, starting up and taxiing out to the duty runway. I started my takeoff roll with 100 percent power and as I glanced out to check control surfaces and wing-lock pin, I found the wings were folded neatly over my head!

" 'Wha hoppen?' Well, my radar operator, whom I instructed to leave the wings folded until we cleared the last plane on the line, was still putting on his hardhat and neglected to manipulate that red-striped handle so necessary for airborne tactics.

"Broken habit pattern, hurry and relying on the 'other guy' were all factors. No excuses from me.

"From now on, fellow mouses, I use my checklist *and* the braille system. Anybody wanna argue?"

STALL NOT

To: Those Who Venture Toward the Unknown

From: Those Who Strive to Preserve Thy Existence

Subject: ComAirLant Disp. 052006z of Nov. 1956; results of intensive investigation of *

1. It is an innate principle of human-guided airborne heavier-than-air structures that the effective relative wind about a cambered surface must be of a proper angle to effectually establish a supremacy of lift over the force of gravity. In the interest of self preservation, all who endeavor to rise above their natural confines on this earth must strive to maintain a velocity and an attitude which are consistent with these requirements. To wit and to what: DON'T STALL.

*ComAirLant cautioned ". . . DURING OCT 5 STALL/SPIN ACCIDENTS IN VARIOUS MODELS COMBAT AIRCRAFT RESULTED IN SEVEN FATALITIES X ALL PILOTS MUST BE EVER MINDFUL OF THE FIRST THING THEY WERE TAUGHT IN FLYING X YOU CANNOT FLY AN AIRPLANE WITHOUT FLYING SPEED X TO FORGET IS FATAL . . ."

TOOL CHECK PLEASE

Anymouse returned to his home field as number 3 in a four-plane flight of AD-4Bs. He broke, reduced power and dropped gear. After about 30 degrees of turn. the left wing dropped and the nose tucked violently.

"I tried to pick up the wing," he said, "and resume a normal attitude. The control pressures were extreme and altitude loss was considerable. I applied full power, picked up the gear and made a recovery somewhat below 400 feet indicated.

"Leaving the pattern, I climbed to 4000 feet, had an escort plane look me over and cycled my gear three times. Everything looked normal and, since control pressures were still unusual, I received permission to make a straight-in landing which I made without further difficulty.

"Examination of the aircraft revealed a gun-charger wrench lodged against the aileron push-rod in the port wing. This wrench had been left in the outboard gun access and, as it was quite rusty, had probably been floating around the wing for some time. The G-forces applied in the landing break evidently forced the tool into its undesirable location.

SHOCK FULL

An APU was disconnected from an aircraft without the power output being turned off. The resulting electrical arc from shorting of plug to APU frame set the APU on fire.

Although the fire was rapidly extinguished, this incident is chock full of potential disaster.

Anymouse recommended more careful checkout of APU operators, and as an added safety factor that the hand-drawn APUs be stopped before disconnecting. — Headmouse

anymouse

and his hairy tales

headmouse

Dear Headmouse:

In your September issue you had a writeup of an S2F crashing in a river. I would like to add a few comments to the writeup.

Let's put any S2F pilot in that aircraft at takeoff and see what happens.

You are actual IFR, at night, and encountering moderate icing and have flown several hours that day of actual instruments. Here is a list of the equipment you would very likely have in operation and the load used by each:

AMPS	EQUIPMENT
150	Prop deicers
66	Main inverter
20	ARC-27
16	ARC-1
4	ARN-6
2	ARC-5
3	ARN-30
4	APX-6
19	standby inverter
16	pitot heaters
12	exterior lights
16	pitot heaters
5	Wing and tail deicers
5	heater
4	G-2 and auto pilot
3	radar altimeter
3	Stall warning
3	Overhead console lights
4	pilot's and copilot's pri. & sec. lights
1	DC instruments
1	G-2 (left hand)
1	trim indicator
1	ICS amplifier
1	Console lights (lower)
2	main inverter control
365	

Now you are set for anything and all of a sudden engine quits. Now why would an engine quit? Under those circumstances a good answer is carburetor icing. No time to think about that now; airspeed is dropping fast so we'll feather. You turn on the auxiliary fuel pumps and start retrimming and by so doing your electrical load increases:

365	
15	Aux pumps
10	Trimmer Actuators

Your total load is now *390 amps* on a 300 amp generator.

But you don't notice that because your airspeed is dropping dangerously low and you must let down in order to keep airspeed. You start transmitting your difficulty and getting a lower altitude.

All of a sudden the operating generator stops operating. It has been carrying a 30% overload all this time and, it won't take it.

Troubles are really multiplying now so you turn off the battery to conserve the power. The first thing you will probably notice if you are letting down at a slow speed is the rudder trimmer goes OFF and you are surprised. You have little left —a flashlight (we hope) and a needle-ball to go with the standby compass. Not very ideal flight conditions but you elect to let down through the overcast in mountainous terrain. God is with you and you manage to break out between some hills over a river and see something that looks like a runway so you elect to land on it. You drop the gear and then full flaps and attempt to land.

Life is looking great again until you turn final and find that you are settling pretty fast, you didn't know that the S2F won't fly in that configuration and you add full power on the operating engine. Your airspeed is 90 knots and you don't know what the directional control minimum airspeed is without the rudder trimmer. Well, the hole finally gets too deep.

Now I ask, how many S2F pilots would not make at least two of these mistakes under the same situation? How many know all this before reading it?

If the pilot would have made it he would have been in the "Old Pro's Club" but, alas, he was a wee bit short. If any one wants to try it just leave me at home with your address book.

ANYMOUSE

You've put yourself in somewhat of hole all right with your hypothesis, but only because you have miscalculated your true generator load and underestimated its capabilities.

Your 365-amp load is lessened by: 1) the standby inverter is not energized while the main inverter is operating—therefore, the true load is 346 amps; 2) if the prop deicer switch is on SLOW, the prop heater draws 150 amps for 60 seconds and then is OFF for 180 seconds; 3) operation of the rudder trimmer actuators is not a continu-

ous 10-amp load (used only as needed to trim the aircraft).

Recalculated, the true continuous steady state load now is 221 amps with a maximum continuous load of approximately 371 amps for 60 seconds, assuming that the rudder trimmer is operated at the same time the prop deicer is ON.

Capacity of the E-1603-1 (2CM73G2) DC generator used on S2F/TF aircraft is rated at 30 volts 300-amp continuous duty with the output regulated to 27.7 volts and is rated for a 150% overload (450 amps) not to exceed 2 minutes. However, under some conditions, such as a low outside temperature (icing conditions), this generator would be capable of maintaining overload for a greater length of time due to cooling air keeping the generator temperature down, as this is what essentially governs the length of time a generator is able to maintain an overloaded condition. O&R test-runs revealed that the E-1603-1 generator will maintain a continuous load of 375 amps as long as the generator temperature does not go above 140°C (280°F).

Very resp'y,
Headmouse

Dear Headmouse:

On a normal mirror-angle deck bolter (due to pitching deck) the tailhook caught the aft corner of port catwalk guard rail and made the hook unsafe light come ON in the cockpit. The pilot continued around and made a normal arrested landing . . . lined up slightly right and angling a mite too, but well within the foul line. Inspection revealed the hook track had rivets popped and . . . the hook was changed.

Sure, I know this was supposed to be reported on a FLIGA form, but . . . everyone out here thinks of FLIGA as a sort of minor AAR and they are scared to death of them. I have tried and tried to explain . . . I have counted over 27 minor crunches on this cruise that should have had FLIGA and didn't and have been told *not* to send FLIGAs for at least five incidents . . . How about an article as to the proper way to look at a FLIGA . . .

Twice now I have made up FLIGAs (indicating a possible ship deficiency) . . . both times I was told to change things . . . What can I do? Maybe I should write a lot more Anymouse Reports . . . there are times that this being a Safety Officer isn't much fun, especially when I can see so much to be done . . .

ANYMOUSE

Cousin, your problem (and you probably have lots of fellow sufferers) is one of those which resist any neat, simple solution—mainly because human nature is a difficult thing to legislate against. The FLIGA program, like many excellent systems, can easily shrivel on a local vine from want of adequate support by the very folks the system is intended to help!

We recognize (but certainly don't approve) in this paradox a certain amount of reluctance to make official note of incidents which may possibly reflect on the reporting outfit, and we can well understand the discouraging effects on a conscientious safety officer.

From here it looks like there's a lot of educating needed to convince the cautious ones that (1) FLIGAs carry no onus of censure or taint of substandard efficiency, and (2) that answers to airplane problems can be pinpointed and developed only from adequate reports of the problem—that lacking sufficient information, the mythical "they," whose job it is to provide the answers, can function only as effectively as their information permits.

In this connection, remember that the folks in BuAer and CNO assume *that no news is good news. It's only the squeaking wheel that gets the grease.*

Admittedly, cousin, this amounts to a philosophical discussion, and you'd like something specific, but it seems the answer to your problem lies in an improved safety philosophy amongst the backsliding people you mention. We can and will help with continuing articles on the importance of a properly *conducted FLIGA program. Maybe some of our readers have some ideas on how to sell the program more effectively —the floor's open for suggestions.*

Very resp'y,
Headmouse

Dear Headmouse:

What justification, if any, is there for operating certain types of aircraft on takeoffs and landings with the plane captain (or flight engineer) positioned on a makeshift seat between the pilot and copilot with no provision for safety belt and shoulder harness.

I refer to transport models, P2Vs and AJs, among others. In the event of engine failure and subsequent immediate ditching following takeoff, it is entirely possible the plane captain would not have time to buckle himself prior to impact resulting in death or serious injury which might have been prevented had he been in his ditching position prior to starting the takeoff roll.

ANYMOUSE

There is no justification for operating P2V and AJ series aircraft with the plane captain positioned on a makeshift seat between the pilot and copilot with no provision for safety belt and shoulder harness. This condition has existed in the P2V-2, -3 and -4 series aircraft only. However, in the event of engine failure and subsequent immediate ditching, the ditching station assigned to the plane captain located very near his usual flight station is considered safe.

The P2V-5, -6 and -7 series aircraft are equipped with permanent fully stressed seats with safety belts in the compartment behind the cockpit. The forward seat which is occupied by the plane captain is situated in a track and can be advanced to a position immediately behind and between the pilot and copilot.

The AJ series aircraft is equipped with a permanent fully stressed seat with safety belt and shoulder harness for the plane captain in close proximity to the pilot and the copilot.

The practice of having the plane captain observe engine instruments as the plane approaches touchdown or during takeoff rolls if he cannot do so from a safe position is considered an unsafe and unnecessary procedure.

Squadron and fleet air wing doctrines require that plane captains shall be seated with safety belt fastened or positioned at assigned ditching station during landings and takeoffs. However, since it is believed that this doctrine is not conscientiously observed, it is recommended that the importance of personnel safety procedures be reemphasized in all P2V and AJ operating activities, especially during landings and takeoffs.

Very resp'y,
Headmouse

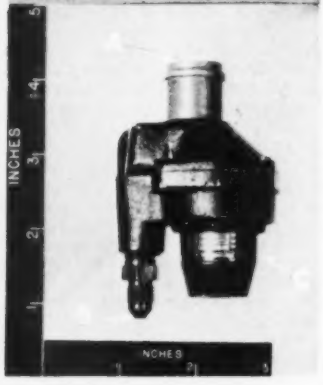
a new oxygen mask regulator

by CDR. Harry G. Bartlett, Jr.,
USNR, Bureau of Aeronautics

Altitude Equipment
Design Section
(AE-51)

(Above) Oxygen mask equipped with the Firewel miniature oxygen breathing regulator—a 100% demand type with automatic safety pressure and automatic pressure breathing. (Below) Close-up of miniature regulator shows:

A. Outlet to mask
B. Inlet port 60-70 psi supply
C. Automatic pressure breathing chamber.



A new oxygen regulator designed for mounting in the inlet to the A-13A (MS22001) oxygen mask has been developed and is being introduced into service use.

The first installation will be in the A4D-1 and will be followed by installations in the F8U-1, F4D-1, F5D-1, F4H-1 and A3J-1.

This mask regulator is part of a newly designed oxygen system for new high performance aircraft. It operates from a 70 psi source, either a liquid oxygen or a reduced high pressure gaseous system. A U-shaped oxygen storage container is mounted in the seat pan, and an integral electrical oxygen hose with disconnects provides for separation from the aircraft on ejection and connection and disconnection from the seat pan on entering and leaving the aircraft.

Oxygen mask regulators are being provided for personal issue to the pilots of those aircraft equipped with these systems.

The oxygen regulator, mask, and hose with disconnect form an assembly, however, they will be stocked and issued as individual items.

The oxygen mask regulator is a 100 percent oxygen demand oxygen regulator with safety pressure and automatic pressure breathing. Because of the safety pressure it is important that the ON-OFF oxygen supply valve located in the console be closed whenever the oxygen system is not in use.

This system has a number of advantages and increased safety of flight. Use of 100 percent oxygen and safety pressure reduces the danger of mask leakage, removes nitrogen from the blood thus reducing aeroembolism (bends), and prevents breathing of noxious gases if present in the cockpit.

In addition, in the event of ejection, the pilot is automatically supplied oxygen from the seat pan and continues to breath on a demand system which is more efficient than the present continuous flow emergency oxygen cylinder. The seat pan mask regulator combination also provides a closed system for underwater escape in the event of ditching.

The mask regulator and nose assembly is also designed, for use in full pressure suit aircraft. In those aircraft equipped with full pressure-suit provisions but where the planned flight will not require that a full pressure suit be worn, the mask regulator, by means of an adapter, may be plugged into the full pressure suit back pan emergency oxygen assembly.

It is extremely important that the oxygen mask inhalation chack-valves be leak tight as leakage will increase exhalation resistence. This leakage is more critical than in existing masks. As the installation of the mask regulator reduces the volume of compensating gas which loads the compensated exhalation valve a small leak will cause a large change in pressure.

As the mask regulator is a 100 percent demand regulator there is no requirement for an oxygen flow indicator.

If the oxygen supply is disconnected there is a sudden positive collapse of the oxygen mask on the face which is an unmistakable warning that there is no flow of oxygen.

In the event that the oxygen supply is reduced below the usable minimums there is a gradual increase in breathing resistance as the supply pressure decreases. It is highly improbable but if this increased resistance is not noticed, there will eventually be no flow when the oxygen supply is exhausted.

Should oxygen be exhausted, immediately, manually, actuate the emergency oxygen supply and descend to a safe altitude.●

nylon or cotton?

A proven product for feminine garments, nylon is often opposed for aviation use—Here are a few facts to shed light on the controversy.

Why have we used both cotton and nylon flight suits?

A. Because each has some points in its favor. The Bureau of Medicine and Surgery did endorse the nylon flight suit for use in the South Pacific during World War II because there were no means available there to keep the byrd-cloth suits clean. Nylon washes easily and dries quickly.

Q. Does this mean nylon is best?

A. No, cotton has two very definite advantages. It absorbs perspiration and therefore is more comfortable, and it can be treated to be fire-retardant to a degree.

Q. Fire — that's what I'm concerned about. Some people say nylon will flare up like celluloid, but I've held a match to a scrap of nylon, and it doesn't flare. But what about fusing to the skin in a fire?

A. We did find that metallized chrome dyes make nylon more flammable, so they are no longer used by the Navy for this fabric. The Naval Medical Research Institute tested the flammability of lightweight nylon *vs* untreated cotton undershirts. The results indicated that the burning effect was about the same for both garments. However, tests were not done against animal flesh.

Q. Well, how come some of the cotton suits aren't treated?

A. Cotton flight suits are no longer manufactured for pilots without a fire-retardant treatment. The Aviation Clothing and Survival Equipment Bulletin No. 6-55 describes the procedure for applying a non-durable fire-retardant compound to existing summer flying suits made of untreated cotton.

Q. How about the treated suits— do they stay treated?

A. Some do and some don't. The fire-retardant cotton flight suit is treated with a non-durable compound which all comes out in the wash. After washing it has to be re-treated in the same manner as the untreated suit.

Q. But they do have a treatment which will last?

A. Yes. The durably-treated cotton flight suit can be washed without removing its protective properties.

Q. How can I tell whether or not my suit is durable treated?

A. Check the label. If it carries the notation "Launder by Formula S," it is durably treated.

Q. The anti-G suit is nylon. How much of a burn-hazard is it?

A. This suit is made of nylon dyed with acetate or acid type dyes. These dyes cause the fabric to be self-extinguishing. That means it burns when in contact with flame but goes out by itself when removed from the source of the fire. However, the nylon will fuse, and to prevent this condition it is recommended that fire-retardant clothing be worn *over* the G-suit.

Q. Does the same requirement apply to the new two-piece winter flight suit?

A. This suit is made of a nylon outer shell dyed with acetate or acid type dyes, an orlon insulating layer and a durable fire-retardant cotton as the inner shell. Although the nylon and orlon materials will fuse on contact with flame, the fire-retardant inner shell will act as a barrier and thus prevent the fused materials from contacting the skin.

Q. And what are exposure suits made of?

A. This is untreated cotton cloth coated with a neoprene rubber compound. The neoprene compound is self-extinguishing, and you have additional fire protection since the two-piece winter flight suit is normally worn under the exposure suit. Efforts have been made to treat the exposure suit fabric with a durable fire retardant, but have been unsuccessful to date because of resultant reduction in tear strength, and the adverse effect upon the neoprene coating.

Q. Looking ahead, what kind of fire-protection can I expect in the high altitude pressure suit?

A. That remains to be solved. The suit is made of a nylon outer shell as the restraint portion and a natural rubber inner shell as the inflatable portion. Since this suit is in the development stages, methods of fire-retardancy are still under consideration.

So now you know what to expect of current and coming equipment, and how to use it for maximum protection. This is a complex subject and you may want more answers. Additional questions should be directed to the Bureaus responsible for the development and testing of these fabrics - BuAer — BuOrd or, Headmouse, NASC, who will be glad to forward your questions.

surgeon notes from your flight

EARS IN A PINCH

There has been a report that the new APH-5 helmets are too tight and cause uncomfortable amount of pressure on the ears. New ear cups are being procured; however, as an interim measure, it's all right for the pilots to remove the cups and trim away some of the white plastic material which acts as a shock absorber. This will make a comfortable fit.

WHY CREWMEN PASS OUT

Next to forgetfulness, ignorance stands as cause of some hypoxia.

The Third MAW Safety Council notes that "the intermittent incidents of transient hypoxia occurring in aircrewmen passengers of the TV aircraft have doubtlessly been due to hastily and poorly fitted oxygen masks and insufficient appreciation of oxygen indoctrination. This situation is being corrected by *required formal oxygen indoctrination review lectures* and checking of mask fit by a competent duty NCO. Pilots are reminded to continue their vigilant observation of voice contact with rear seat passengers."

Also, OpNav Inst. 3710.7 requires the fitting procedure for all flight personnel, and 3740.3A requires periodic training and the continuing nature of such training. Review lectures should certainly help meet the question of "Insufficient appreciation" of the oxygen indoctrination.

"WRITING ON THE WALL?"

An Airborne Equipment Division progress report states that a spinal support garment designed to improve body positioning has been fabricated and is currently undergoing comprehensive tests in order to confirm its specific suitability for general service use.

Also, investigation of the design of an energy-absorbing seat cushion is continuing. Design of such a cushion is complicated by the fact that crash restraint is seriously compromised during the energy absorption phase by the reduction of lap belt and shoulder harness tightness.

SOLVENT SICKNESS

Another health hazard was found in ethyl acetate, used for hand cleaning jet engine rotor assemblies which offer a very large area for evaporation. The solvent was applied with a brush and rag.

When the man doing the cleaning became ill and reported to the dispensary, air tests were made and it was found that concentrations of ethyl acetate at the point of operation were too high for safety. (300-800ppm.)

It was recommended the man wear a respirator, preferably of the supplied air type, until a mechanized cleaning cycle can be developed.

AUTOMATIC INFO

The proper nomenclature for the automatic seat belt separator and parachute opening devices is as follows:

MS 16036 Pilot's Automatic Lap Belt, MK 1 Mod O, 3/4-second delay cartridge.

Automatic Release Actuator, P/N 1000A, Master Specialists — cartridge-actuated.

Barometric Release, MK V, Irvin.

These devices come under the cognizance of ComAirLant and ComAirPac for priority assignment, distribution and control.

PASSENGERS BREATHE TOO

After investigating an accident, the flight surgeon made this plea for passengers in his recommendations:

1. That passengers riding in any aircraft be *required* to wear *all* of the safety equipment available to pilots in the type aircraft they are flying.

2. That passengers riding in jet aircraft be thoroughly indoctrinated in high altitude physiology and ejection seat procedure before they are allowed to fly in a jet.

3. That proper fit of all equipment used by passengers, i.e., hardhat, oxygen mask and G-suit is essential and as much care should be exercised as for a pilot.

UNDERWATER EJECTIONS

BuAer is establishing an underwater canopy and ejection seat test program to obtain basic data which will be used in design of canopy mechanisms, canopies and ejection seats. This program will include testing of escape systems at various depths.

As one of the tests, fully loaded ejection seats will be fired through closed and locked canopies underwater. At present, no information is available concerning the feasibility or advisability of utilizing the ejection seat for underwater escape.

KEEP YOUR SHIRT ON

Two cases of "hemorrhagic purpura" (a slight bleeding into the skin) were recently reported which occurred to flight personnel who were wearing impregnated summerweight coverall flight suits, without wearing undershirts.

Though some individuals are more susceptible than others, and since the flight suit is suspected, the area of contact with the skin will be reduced considerably if you keep your shirt on.

COMPLICATIONS

Prior to takeoff in a T-28B the pilot closed the canopy on his right hand which was resting on the windshield. The pilot's right index finger received minor injury. The pilot freed his hand and proceeded with the takeoff. Shortly thereafter, he instructed the dual pilot to take control, and then lost consciousness. While he was unconscious, both feet slid under the rudder pedals which caused minor injury to the pilot's ankles. The dual pilot landed the aircraft.

Any time a pilot sustains injury, no matter how slight, the flight should not be continued without his checking with the flight surgeon to determine the actual extent of his injury. He would thus avoid any possiblity of further complications.

CHECK THOSE CIGARETS

The Aviation Safety Officer of MAG 11 reports an interesting story concerning an oxygen regulator removed from a TV aircraft and sent to the oxygen shop for repair. Reason for the removal: an unknown leak in the regulator. Upon inspection, the cause of the leak was discovered. Some person (unknown) had laid a cigaret on top of the oxygen regulator while he was busy with other chores (perhaps flying the aircraft or taking a good gulp of 100% oxygen, or working on the aircraft). The cigaret had burned through the plastic cover of the flow indicator.

OFF VALVE OFF?

Some pilots feel that there is a real problem in the possibility of forgetting to turn on their oxygen.

It is suggested that the commanding officer of a squadron can make it a local policy to wire the oxygen regulator shut-off valve to ON.

The valve should not be removed. If it is removed, there is no way to make a regulator leak test, and no way to close the valve to prevent leaks when the system is not in use.

OPERATION SUCCESSFUL BUT PATIENT DIED—A recent forced landing in an AD-4NA was experienced due to complete loss of power. An inspection of the engine disclosed a master bearing failure and subsequent severe internal damage to the engine. Metal particles were found throughout the engine and, although the disc strainer was heavily packed with carbon, no indications of oil starvation were observed.

Examination of the engine log book revealed that the engine had been removed from the aircraft just prior to engine failure for replacement of broken generator mounting studs and re-installed in the same aircraft. Close inspection of the rear cover and the replaced studs revealed that helicoils had been utilized in the repair. The threaded stud holes extended through the rear cover into the accessory section. Therefore, it is believed that the metal chips entered the oil system during the drilling and tapping operation, necessary for the installation of the helicoils.

It is also believed that a sufficient amount of metal chips by-passed the carbon-packed disc strainer, causing the master rod bearing to fail after 1.1 hours of operation time subsequent to stud repair. All other major damage resulted from master rod bearing failure.

FROM THE GROUND UP

Notes and Comments on Maintenance

Approach

FJ SEAT ARMING—Two recent instances were reported of unintentional arming of FJ-3 ejection seat guns. Postflight investigation revealed that the ejection seat gun safety pins had been pulled. Ground tests with normal operation of the canopy indicated that the reel assembly cable exerted excessive tension on the ejection gun safety pin. This tension pulled the pin allowing the seat to arm.

Upon removal and inspection, the reel assembly P/N 144-71039-5, was covered with an excessive amount of paralketone. The excessive paralketone on the reel spring coil caused the reel to bind resulting in greater than normal tension on the cable.

When reel assembly was cleaned thoroughly with kerosene, the excessive paralketone was removed. This action restored the reel assembly to its normal operating condition. The parts description may be found in NavAer 01-60 JKO-504, FJ–4 Illustrated Parts, figure 40, page 98 items 17 and 29.

LOSS OF F2H INLET DUCT DOOR BOLTS—It is a known fact that one screw or nut will damage an axial-flow jet engine to an extent of overhaul or may even cause it to disintegrate.

A recurring unsafe condition was brought to light again when a well trained plane captain of an F2H-3 aircraft found the inlet guide vanes, compressor section and turbine section damaged on a preflight inspection.

Further investigation revealed a bolt, washer, and nut from the inlet duct door missing. A bolt and nut on the opposite door was found loose (see Illustrated Parts Catalog AN 01-245-FB6-4 page 385 figure 115 item 35).

The reporting squadron recommended that all F2H aircraft be inspected to insure security of these bolts. BuAer has recommended that the elastic stop nuts not be reused on this component. In the meantime, the contractor is investigating further for a more satisfactory means of securing inlet duct doors.

DIDN'T KNOW THE GUN WAS LOADED—The hangar fire watch, while making one of his tours, approached the open cabin door of an SNB. He noticed the Very's pistol hanging in its pouch on the aft baggage compartment bulkhead.

Never having seen one of these pistols before, his curiosity got the better of him and he reached in and removed the pistol from its pouch. While examining it and with it still aimed into the cabin, he pulled the trigger, discharging a flare into the cabin.

He ran for a fire extinguisher but could not remove it from its rack. He ran back to the plane as the assistant duty officer, who was making an inspection tour, saw the smoke billowing from the cabin. The ADO extinguished the fire.

OXYGEN SERVICE LINE WEAR—Recent fleet reports indicate that the aircraft oxygen service lines are being chafed by various control assemblies in the A4D-1, F9F-6 and TV-2 aircraft.

Since installation specifications require adequate clearance, it appears that oxygen service lines are being improperly installed, or are bent after aircraft deliveries. Maintenance personnel should inspect all aircraft systems for wear or improper assembly to insure that there is adequate clearance between moving control assemblies and/or exposed electrical lines. All defective lines should be replaced.

FROM THE GROUND UP

FJ-3 EGT FLUCTUATION—The pilot of an FJ-3 reported fluctuations at 175 to 200°C of exhaust gas temperature during flight.

Investigation revealed excessive wear in the bushing of rod and uniball assembly, Part No. 195783, of J65-W4B fuel control S/N R85-BPD-190544-2. This wear allowed small free movement of cut-off link assembly, Part No. 195769. A washer, Part No. P15350, was missing and apparently worn off. The cut-off link assembly could possibly separate if continued to operate under above condition.

The squadron operating this FJ-3 revealed a second imminent failure of the fuel control Cut-off Link Assembly in another FJ-3.

It is recommended that all activities operating FJ-3 aircraft inspect the fuel control linkage for excessive wear and report discrepancies to BuAer by Safety of Flight AmpFUR.

J34 FUEL LEAK—After an in-flight explosion resulting in damage to the starboard engine nacelle on a P2V-5F airplane, the engine, model J34-WE-34, was sent to overhaul and repair for Disassembly and Inspection. The Disassembly and Inspection Report (DIR) follows:

"The engine was operated in the test cell in an 'as received' condition. At 75% rpm, a heavy stream of high pressure fuel was observed spraying from the large plug opposite the fuel supply inlet of the dump valve, Part No. 61F368. The plug was found to be safety-wired in a finger tight condition, and the gasket, Part No. 61H492-12, was against the exterior of the dump valve plug boss, and not seated in the counterbore of the dump valve boss as it should have been. When the fuel manifold was pressurized sufficiently by increasing engine RPM for take-off, fuel under high pressure sprayed out around the gasket into the engine nacelle, and undoubtedly caused the explosion and resulting damage to starboard nacelle."

The DIR noted that this type of discrepancy has been noted on other J34 series engines during ground run-up. This occurred when this plug was removed during depreservation of the fuel system in accordance with par. 4–50 of AN 02B-110BA-2.

If the gasket is properly installed, the plug can be turned until the plug head seats against the dump valve boss, allowing the gasket to seat in the dump valve housing counterbore.

If the gasket hangs up on the bevel of the dump valve boss, preventing the plug head from seating against the dump valve boss, the installation is subject to leakage, and the gasket should be replaced with a new one, properly installed.

F2H SPEEDBRAKE FAILURES—A recent AmpFUR reported failures of the speedbrake screwjack support on F2H aircraft.

Recent correspondence from BuAer and the contractor indicates that the reported failures are not due to any structural deficiency, but rather, are caused by over-run of the screwjacks, due to improper mechanical rigging or improper adjustment of the "retract" limit switch mechanism, or both.

Adjustment of the limit switches should not be used to compensate for improper mechanical rigging of the speedbrake mechanism. They should be properly rigged mechanically, and the limit switches then set as prescribed to provide proper operation, particularly proper closure without over-run of the actuator.

Since the position of the port mechanism determines actuator cut-off in each direction, the port and starboard mechanism must be synchronized before they are operated electrically and before the cams and limit switches are adjusted. It is believed that proper adjustment of the speedbrakes in this manner will prevent the occurrence of abnormal stresses in the support structure which result in failures such as those reported.

Caution: The back-up structure and drive systems for electrical actuators on these aircraft are, in most instances, not capable of withstanding the full output load of the actuators. Since electrical actuators will momentarily produce a load of 5 to 10 times the normal rated output of the actuators, it has been deemed impracticable from a weight standpoint to design the structure for the full output load of the actuators. Consequently, improper adjustment of the actuactor mechanism and drive system will almost invariably result in a failure in some part of the system or back-up structure.

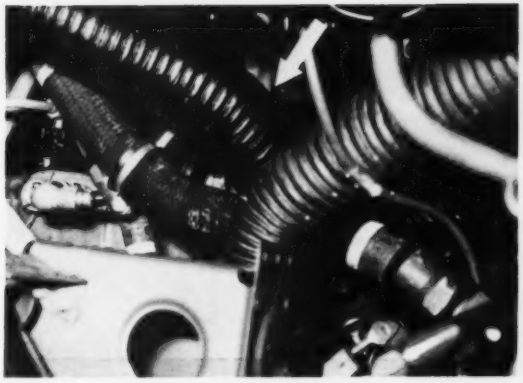
MURPHY'S LAW*

A simple reversing of flexible ducts in an AD-4B recently caused CO contamination so severe that the pilot's eyes burned and he became nauseous after only a few minutes in the airplane.

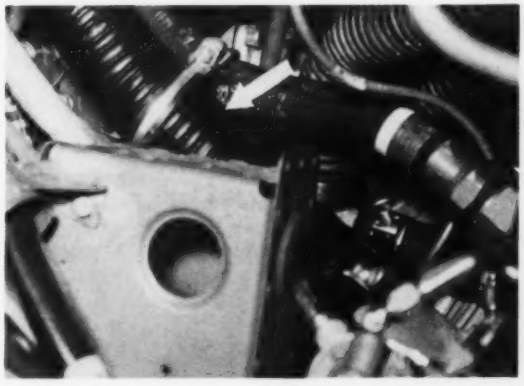
The cause was so obvious that it was overlooked by several well-qualified maintenance inspectors who were trying to determine the source of the offending fumes.

The engine breather line from the left side of the engine should be attached to an overboard drain manifold. It was attached, instead, to the "Y" fitting on the oil cooler duct. This allowed "breathed" fumes and vapors to enter the line which carries blast air through the firewall for cooling voltage regulators.

This incorrect hookup was camouflaged by the fact that there are two additional flex lines in the area. Normally they attach the left generator and the hydraulic reservoir to the oil cooler "Y" duct. In this case, one of them was attached to the overboard drain manifold where the engine breather belongs.—*Air Maint. Office (Planning), NAS Akron, Ohio*



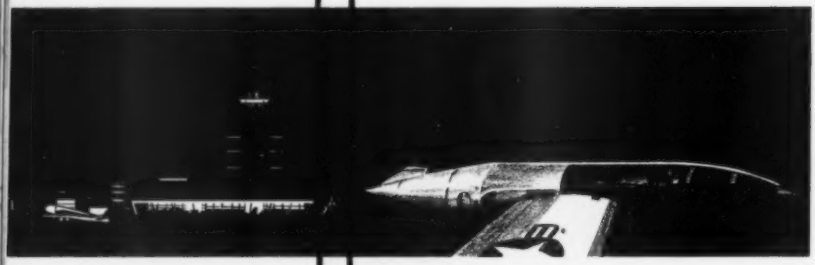
Incorrect: Engine breather tubing (arrow) attached to "Y" fitting on oil cooler duct. Hydraulic reservoir blast tube attached to overboard drain fitting.



Correct: Engine breather tubing (arrow) attached to overboard drain line.

* IF AN AIRCRAFT PART CAN BE INSTALLED INCORRECTLY, SOMEONE WILL INSTALL IT THAT WAY.

TIP TANK



Miscellaneous aviation safety information

GO, GO, GO!

Jet pilots will want to read OpNav 3750.12 if they have not yet seen or heard about it. The subject is "Guide lines concerning ejection from jet aircraft during emergencies." These guide lines are the result of the experience data developed by the Naval Aviation Safety Center and recommendations submitted by all major air commands.

ONE-WAY AIRWAYS

"Pilots operating IFR clearances on one-way airways during VFR conditions should make certain the altitude they accept is the proper one for their direction of flight were it a two-way airway.

"Reason for this is that VFR legally operates in accordance with normal altitude separations procedures, in both directions on one-way airways. Therefore, it is necessary for a pilot operating on a one-way airway to be either on instruments or heading in the proper direction, assuming the airway to be a two-way airway during VFR conditions."—*Technical Talk for Pilots.*

TIRE INFO NEEDED

In a recent attempt to compare *new* versus *recapped* tire reliability, a review of F9F aircraft accident reports and FLIGA's revealed that the desired information was not included in a majority of the reports.

This precluded any use of these reports in evaluating the current recap tire policy.

Commands are urged to include, in any aircraft accident or FLIGA report listing "material failure of tire" as a casual factor, the same information itemized below as required by BuAer Instruction NavAer 00.58A (page 3) for the FUR report:

a. Which wheel the casing (tire) or inner tube was mounted on.

b. Number of plies and/or rating.

c. Fabric construction.

d. Whether new or recapped casing.

e. Casing serial number and date of manufacture.

f. If reconditioned, name and/or identification symbol.

g. Estimated percentage of wear.

h. Reason for removal (with photograph of the unsatisfactory condition whenever possible).

DEMON CRASH DOPE

A crash rescue booklet on the F3H *Demon* has been prepared by McDonnell Aircraft Corporation and copies are to be sent to all Navy, Air Force, and civilian bases who have crash equipment to handle this type aircraft.

The booklet was prepared to furnish military and civilian air base crash crews with unclassified rescue and fire fighting information relating to the F3H.

A limited number of copies will be available on request from McDonnell's Tech Reps or by writing McDonnell Aircraft Corp., Engineering Dept., St. Louis 3, Mo.

NEAR-MISS

A jet pilot making a range approach to NAS Key West cancelled his IFR flight plan when inbound. Meacham Field, a non-military airport, lies between the range station and NAS Key West. An aircraft making a range approach must pass over this field.

The jet went boring across Meacham Field below 1000 feet, narrowly missing a transport in the Meacham traffic pattern.

In this case the jet pilot was in error as he had cancelled his IFR plan and then did not conform to VFR regulations.

A possible source of confusion was the fact that the jet letdown plate for NAS Key West (JAL-214-ADF) does not show Meacham Field between the range and NAS Key West. The NAS commanding Officer noted that a change to the letdown plate will be issued.

Near-Miss reports of this nature should especially be filled out by the pilot concerned, preferably both on a Civil Aeronautics Board form 329 (See December *Approach*, page 29), or on Anymouse form.

A waveoff did a pilot decline
When on night GCA doing fine—
He touched down very neat
On the lengthy concrete
Nine-tenths of which was behind.
—*CNABaTra Flight Safety*

approach

Approach offers articles of interest to aviation personnel in flight operations, aeromedicine and maintenance, along with the famous hairy tales of Anymouse!

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Please send APPROACH, The Naval Aviation Safety Review (NAVAER 00-75-510) for one year.

Enclosed is a check (or money order) for $_____.

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OLD PRO CLUB

CAPT Arthur T. FINNEY, USAF *(Exchange Pilot)*

Aircraft: F9F-5, ATU-202

At 18,000 feet on a cross-country flight, Captain Finney was suddenly confronted with an explosion in the engine section, severe vibrations and a cockpit filled with smoke. Calmly executing all emergency procedures while quickly checking his position, he shut down the engine and set up a glide to the nearest field, Williams AFB, 20 miles distant. A precise flame out approach was made and the aircraft landed without damage.

LCDR F. E. STRUTHERS

Aircraft: P4M-1Q, VQ-1

Returning from a routine patrol flight at night and in actual instrument conditions, LCDR Struthers suddenly experienced a continuous extreme vibration. The starboard tachometer had been reading erratically throughout the flight, but the pilot performed a quick, thorough examination before taking action. By so doing, he determined that the trouble was in the port engine, not the starboard, and it was feathered. Landing was made without further incident. Twelve inches had broken off one of the blades of the port prop and most of the Lord mounts had been sheared.

LTJG Albert W. WHEELER, USNR-R

Aircraft: HO4S-3, HS-6

On a night syllabus training flight in an HO4S-3 while at 500 feet and one mile off shore, Lt (jg) Wheeler experienced complete engine failure. He immediately set up an auto-rotational descent. Just prior to reaching the water, the engine started to run again. He transitioned to forward flight and with severe engine vibrations, barely enough power to maintain altitude, headed for the beach where he effected a successful landing in a vacant lot. There was no additional damage to the helicopter.

LCDR Charles M. VEHORN, USN; ENS John G. COLLIER, USNR

Aircraft: P5M-1, VP-48

The starboard engine of the P5M-1 failed at 4000 feet during climbout. An explosion started an engine fire. The pilots immediately feathered the engine, closed fuel/oil shut-off valves and actuated the engine fire bottles, extinguishing the fire. Bomb-bay tanks were dropped and fuel jettisoned to reduce the load to single-engine weight. After declaring an emergency, the pilots returned to base and made a normal single-engine landing, still weighing approximately 64,000 pounds.

Recognition of heads-up flying is essential to a positive program of flight safety. Each month, Approach will acknowledge certain selected individuals whose exhibited flying ability merits membership. Old Pro's also receive a wallet membership card as a memento of the occasion. Commanding officers are invited to submit nominations for selection.

Well Done

Sergeant Samuel L. Stulce, of Cherry Point has prevented 13 wheels-up landings.

WELL DONE, Sergeant Samuel L. Stulce. At $25,000 apiece, Sergeant Stulce has saved us taxpayers some $325,000 in the past 2 years by keeping a watchful eye on aircraft approaching for a landing with their wheels up.

The sergeant, attached to the station operation and engineering squadron, has prevented 13 local pilots from scorching the seats of their pants when attempting a landing with wheels up.

Holding the honor of being one of the first Marines to work on the Mobile Control Tower here, Sgt. Stulce says the work may involve long, lonesome hours in all types of weather but he wouldn't trade jobs with any one.

Stulce, has been working at his job for over 2 years and in that time not one plane has gotten past him with its wheels up. "But one time I thought my record was shot." Stulce remembered. "An F9F *Cougar* was shooting flameout landings and after four passes was coming around for his fifth. When he was about 50 feet off the ground I saw his wheels were still up. Grabbing a flare gun I fired and at first thought he was going on in but when he was four feet off the deck he took my waveoff and poured on the coal."

Major E. W. Turcotte, aviation safety officer of the air station stated, "With the emphasis that is being placed on the prevention of wheels-up landings in the Marine Corps, Sgt. Stulce has shown outstanding ability in his job and has worked many hours to ensure the safe landing of hundreds of planes each day."